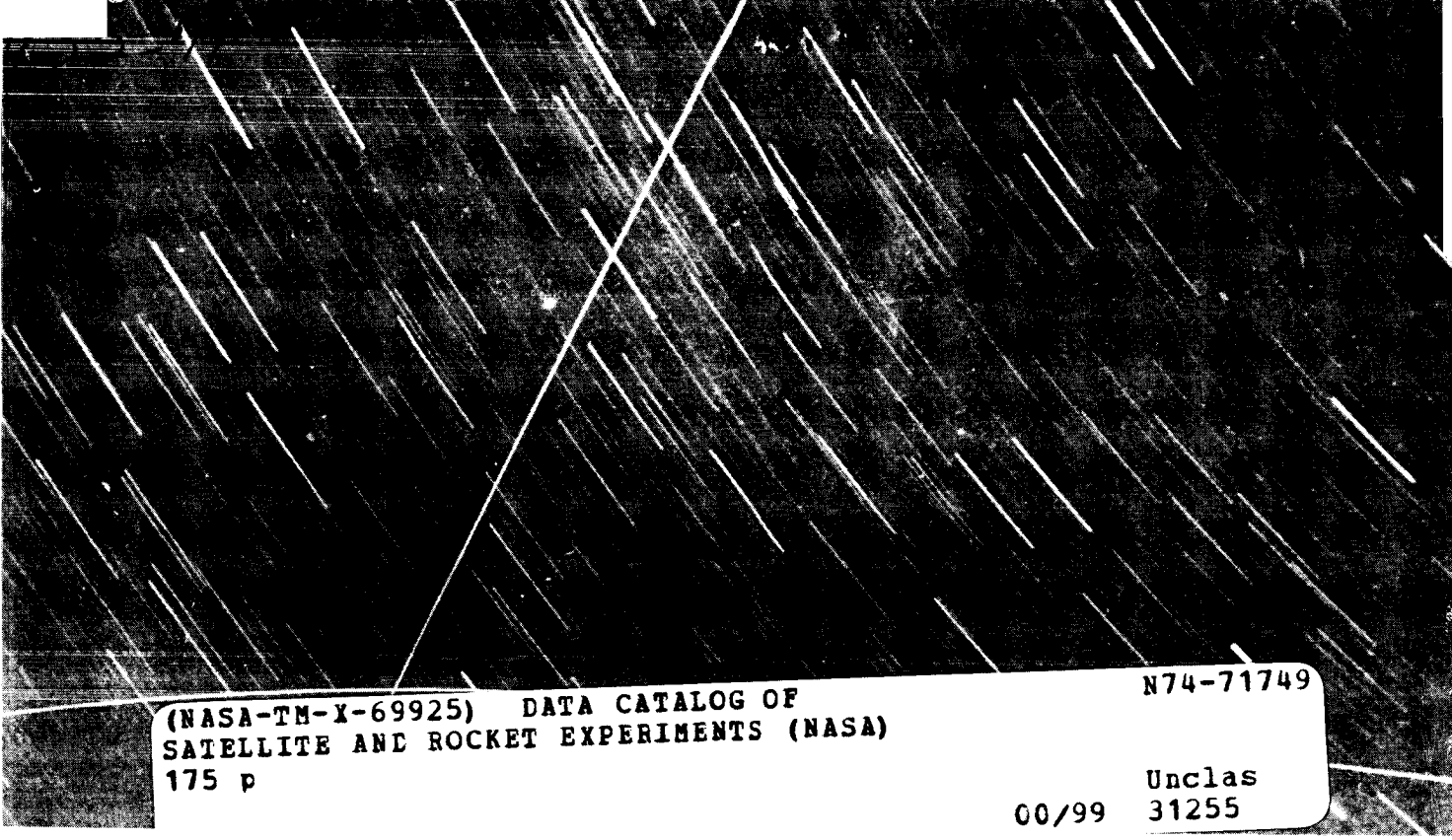

DATA CATALOG

NSSDC 68-12

SATELLITE AND ROCKET EXPERIMENTS

JULY 1968

SUPERSEDES ALL PREVIOUS EDITIONS

NATIONAL SPACE SCIENCE DATA CENTER

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION • GODDARD SPACE FLIGHT CENTER, GREENBELT, MD.

NATIONAL SPACE SCIENCE DATA CENTER

DATA CATALOG

OF

SATELLITE AND ROCKET EXPERIMENTS

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National Aeronautics and Space Administration
Goddard Space Flight Center
Greenbelt, Maryland 20771

CONTENTS

Page

INTRODUCTION

PURPOSE

The purpose of this *Data Catalog of Satellite and Rocket Experiments* is to announce the availability of reduced experimental space science data, to describe these data, and to inform potential data users of the services provided by the National Space Science Data Center (NSSDC).

This *Catalog* is published semiannualy, in January and July. A companion volume, the *Catalog of Correlative Data* (data primarily obtained by ground-based instruments and scientific facilities) is published biennially. An up-to-date listing of available correlative data is maintained at the Data Center.*

DATA DESCRIPTION

This *Catalog* lists data obtained from experiments carried into the upper atmosphere and space by satellites, probes, and sounding rockets. All data listed herein have been collected after July 1957.

The data are stored in tabular, graphic, or computer forms. The content, form, and volume of the data obtained from each experiment are indicated in the experimental data descriptions provided in this *Catalog*. References to *Data Users' Notes*, which describe the reduction techniques and data format, are also included as appropriate.

CATALOG ORGANIZATION

This *Catalog* is divided into seven major parts plus appendixes. The first four parts are discipline oriented and are arranged according to satellite launch date. The remaining sections of the *Catalog* contain listings of rocket data, satellite maps, and data still being processed at NSSDC. As another point of entry, Appendix A also provides a listing by electron and proton detector threshold energies of appropriate experiments listed in the *Catalog*.

As a special service, the Data Center will provide qualified users with B, L transformation computer programs as prepared by Dr. C. E. McIlwain (University of California at San Diego). These are described in Appendix B.

DATA AVAILABILITY AND COSTS

Data listed in this *Catalog* are available for use in scientific investigations. Data can be provided in the forms listed under each experiment description. As resources permit, for small requests the Data Center will attempt to supply the data requested without cost to the user. When a charge for reproduction and dissemination of data becomes necessary, the requester will receive notification of the costs before the data are sent.

*Correlative data are available to NASA personnel; other users may view the data at NSSDC, or may obtain the information directly from the appropriate source, which will be provided upon request.

ORDERING PROCEDURES

A user may obtain data in any of the following ways:

1. Letter request
2. Data Request Form (two forms are included at the end of this *Catalog*)
3. Telephone request
4. On-site request (see Facilities and Services Section)

Anyone who wishes to obtain data for a scientific study should specify the name and/or number of the satellite/rocket and the experiment, the form of data, and the timespan of data requested. A user should also specify why the data are needed, the subject of his work, the name of the organization with which he is connected, and any Government contracts he may have for performing his study.

When a user requests data on magnetic tapes, he should provide additional information concerning his plans for using the data, e.g., what computers and operating systems will be used. In this context, the Data Center is compiling a library of routines which can unpack or transform the contents of many of the data sets into formats which are more appropriate for general use. NSSDC will be happy to provide information concerning the services it can perform for any given data set.

When requesting data on magnetic tape, the user must specify whether he will:

1. Supply new tapes prior to the processing, or
2. Return the original NSSDC tapes after the data have been copied

LOCATION

NSSDC is located in Building 26 at the Goddard Space Flight Center in Greenbelt, Maryland. The Data Center's official address is:

National Space Science Data Center
Goddard Space Flight Center
Code 601
Greenbelt, Maryland 20771

Phone: 301 982-6695

FACILITIES AND SERVICES

The Data Center at present has on file data in the media specified in each experiment description. Resident and visiting scientists are invited to study the data while visiting the Data Center. In addition to having reproduction capabilities, NSSDC provides facilities for on-site data use. The Data Center staff will assist users with individual data searches and with the use of equipment.

PARTICIPATION

The National Space Science Data Center invites members of the scientific community to contribute data from satellite and sounding rocket experiments. NSSDC assigns a specialist in the appropriate scientific discipline

for each experiment to arrange for data acquisition with the principal investigator and to help solve related problems. Acquired data will be cataloged and made available to users according to established procedures. Scientists who have not been contacted by one of the subject specialists and who have analyzed or reduced data available for contribution are requested to contact NSSDC in order that transferral of the data may be arranged.

The Data Center is continually striving to increase the usefulness of this *Catalog* by improving the data descriptions and including all pertinent information. A number of the data descriptions have also been rewritten for this issue, and, whenever known, the spacecraft orbital parameters and the investigators' names and affiliations have been included in the announcement of data. Scientists are invited to submit their comments or recommendations to NSSDC regarding the data available, the services provided, and the contents and format of this *Catalog*. The Data Center is attempting to distribute the *Catalog* to all interested scientific personnel. Recipients are urged to inform potential data users of its availability. Anyone wishing to receive a copy of this publication can have his name added to the distribution list by phone or letter request.

ABBREVIATIONS

Abbreviations used throughout this *Catalog* are listed below. Note that the same abbreviation is used for both the singular and plural. In some cases the number of letters in an abbreviation has been limited for use in computerized listings.

A	- angstrom unit
AFB	- Air Force Base
AFCRL	- Air Force Cambridge Research Laboratories
AHMD	- Ahmedabad, India
AI	- Ascension Island, B.W.I.
AIL	- Airborne Instruments Laboratory
Alosyn	- Alouette topside sounder synoptic data
amu	- atomic mass unit
AND	- Andoya, Norway
Ap	- magnetic activity index
APL	- Applied Physics Laboratory (Johns Hopkins University)
ARC	- Ames Research Center
ASE	- American Science and Engineering, Inc.
AU	- astronomical unit
AVCO	- AVCO Corporation
BARK	- Barking Sands, Hawaii
BBRC	- Ball Brothers Research Corporation
BCD	- binary coded decimal
BERN	- University of Bern
BE-SYS	- Bell System
BNRC	- British National Research Committee
bpi	- bits per inch
BRL	- Ballistics Research Laboratory
BTL	- Bell Telephone Laboratories
B.W.I.	- British West Indies
°C	- degrees Celsius (Centigrade)
CALB	- University of California, Berkeley
CALU	- University of California

CAS	– Cassino, Brazil
cc	– cubic centimeter
CDC	– Control Data Corporation
cm	– centimeter
CNET	– Centre National d' Etudes des Telecommunications
COLL	– University of Alaska
COLO	– University of Colorado
COMP	– composition
CORN	– Cornell University
CR	– counting rate
CRL	– See AFCRL
CRO	– Ship Croten
CRPL	– Central Radio Propagation Laboratory, now ITSA, ESSA
CSIR	– Commonwealth Scientific and Industrial Research Organization
dc	– direct current
DCS	– direct couple system (IBM)
deg	– degree
DOD	– Department of Defense
DOP	– Doppler Shift (reduction method)
DRTE	– Defence Research Telecommunications Establishment, Canada
DUDL	– Dudley Observatory
EGL	– Eglin AFB, Florida
emf	– electromotive force
ESSA	– Environmental Science Services Administration
et al	– and others
euv	– extreme ultraviolet
ev	– electron volt
FC	– Fort Churchill, Canada
F.L.	– focal length
FR	– Faraday Rotation (reduction method)
FSU	– Florida State University
ft	– foot
Ft.	– Fort
GCA	– Geophysics Corporation of America
GE	– General Electric Corporation
GHz	– gigahertz
GIT	– Georgia Institute of Technology
GM	– Geiger-Mueller
gm	– gram
GMT	– Greenwich mean time
GSFC	– Goddard Space Flight Center
HARV	– Harvard University
HOL	– Holloman AFB, New Mexico
hr	– hour
HRIR	– high-resolution infrared radiometer
Hz	– hertz

IBC - International Brightness Coefficient
IBM - International Business Machines
ID - Identification
ILL - University of Illinois
in. - inch
INCO - INCOSPAR (India)
Is. - Island
ITSA - Institute for Telecommunication Sciences and Aeronomy, ESSA

JHU - Johns Hopkins University
JPL - Jet Propulsion Laboratory

°K - degrees Kelvin
KAR - Karachi, Pakistan
kev - kiloelectron volt
KIR - Kiruna Geophysical Observatory
KNZ - Cape Karikari, New Zealand
KOR - Kononi Beach, Greece
km - kilometer
KRON - Kronograd, Sweden
KYU - University of Kentucky

L - lambert
LARC - Langley Research Center
LASL - Los Alamos Scientific Laboratory
LERC - Lewis Research Center
LKHD - Lockheed Missiles and Space Division
LRL - Lawrence Radiation Laboratory

ma - milliampere
MDU - University of Maryland
Mev - million electron volts
mg - milligram
mh - millihenry
MHz - megahertz
MICH - University of Michigan
min - minute
MINN - University of Minnesota
MIT - Massachusetts Institute of Technology
mm - millimeter
msec - millisecond
MUN - Munich, Germany

NASA - National Aeronautics and Space Administration
NAT - Natal, Brazil
NBSB - National Bureau of Standards, Boulder, Colorado
NCAR - National Center for Atmospheric Research
NDRE - National Defence Research Establishment
NHU - University of New Hampshire
No. - number
NOTS - Naval Ordnance Test Station

NRL	- Naval Research Laboratory
NSSDC	- National Space Science Data Center
NWSC	- National Weather Satellite Center
NYU	- New York University
OAO	- Orbiting Astronomical Observatory
OGO	- Orbiting Geophysical Observatory
OSO	- Orbiting Solar Observatory
PB	- Point Barrow, Alaska
PITT	- University of Pittsburgh
PMR	- Pacific Missile Range
p-n	- positive-negative (junction)
Pr.	- Prince
PRC	- Pakistan Space and Upper Atmosphere Research Organization
PRIN	- Princeton University
PRL	- Physical Research Laboratory, Ahmedabad, India
PROGAGT	- propagation
PSU	- Pennsylvania State University
Pt.	- Port
PTAR	- Point Arguello, California
PTMU	- Point Mugu, California
PUSC	- Pennsylvania University Space Center
RCA	- Radio Corporation of America
REL	- Raymond Engineering Laboratory, Inc.
RES	- Resolute Bay, Canada
rev	- revolution
RF	- radio frequency
RICE	- Rice University
RNMI	- Royal Netherlands Meteorological Institute
RRL	- Radio Research Laboratory, Tokyo, Japan
RSRS	- Radio and Space Research Station
SARD	- Sardinia, Italy
SCAS	- Southwest Center of Advanced Studies, Dallas, Texas
sec	- second
SNI	- San Nicolas Island, California
SON	- Sonmiani, Pakistan
SRI	- Stanford Research Institute
ster	- steradian
STKU	- Stockholm University, Sweden
STL	- Space Technology Laboratory (Now TRW Systems Group)
SUI	- State University of Iowa (Now University of Iowa)
SUR	- Surinam
SYRA	- Syracuse University
TEMP	- temperature
THU	- Thumba, India
TRW	- TRW Inc.

U	- university
UCHI	- University of Chicago
UCL	- University College of London
UCLA	- University of California at Los Angeles
UCSD	- University of California at San Diego
UIA	- University of Iowa
ULA	- University of Alaska
USC	- University of Southern California
UT	- universal time
UV	- ultraviolet
v	- volt
VAR	- Varian Associates
VLF	- very low frequency
vs	- versus
WI	- Wallops Island, Virginia
WISC	- University of Wisconsin
WOO	- Woomera, Australia
WS	- Wallops Station, Virginia
WSMR	- White Sands Missile Range, New Mexico
Z	- atomic number
γ	- gamma
λ	- wavelength
μ	- micron

PART I. FIELDS AND PARTICLES

A. Radiation Zone Measurements

EXPLORER 1 - 1958 ALPHA 1

Apogee	2550 km	Period	115 min
Perigee	358 km	Inclination	33°

Energetic Particles Experiment

Investigators:
J. A. Van Allen–State University of Iowa*
G. H. Ludwig**–State University of Iowa*

The radiation detector was an Anton type 314 Geiger-Mueller (GM) tube having an omnidirectional geometric factor of 17.4 cm^2 ster, a total shielding of 1.5 gm/cm^2 of stainless steel, and an efficiency of 0.83 for fast charged particles which penetrate the effective volume directly. The shielding corresponded to the threshold energy of 30-Mev protons or to the extrapolated energy of 3-Mev electrons.

The tabulated data on approximately 900 pages are available for the period of February 1 to March 15, 1958, and include the following:

1. Time of observation
2. Geographic position of satellite
3. Receiving station
4. Counting rate
5. Number of events, scaled by 32, which occurred during time interval

A *Data Users' Note* (NSSDC 67-13) covering the reduction techniques and format of available data may be obtained from NSSDC.

PIONEER 2

No orbit achieved.

*Now called University of Iowa.
**Now at Goddard Space Flight Center.

Proportional Counter Telescope Experiment

Investigator:

J. A. Simpson–University of Chicago

A triple coincidence proportional counter telescope was used to measure cosmic-ray flux on the Pioneer 2 lunar probe. Since the third-stage booster failed to ignite, the experiment was confined to the altitude region below 963 miles. However, the brief flight provided evidence that the earth's equatorial region has higher flux and energy than previously suspected.

The data obtained were restricted to a 12-min period from:

November 7, 1958, 07 hr 40 min 30 sec to
November 7, 1958, 07 hr 52 min 5.6 sec

Data are available on a printed sheet and include:

1. Time of observation (UT)
2. Geographic position of probe
3. Average counting rate

EXPLORER 4 - 1958 EPSILON 1

Apogee	2210 km	Period	110.2 min
Perigee	262 km	Inclination	51°

Trapped Radiation Experiment

Investigators:

J. A. Van Allen–State University of Iowa*
C. E. McIlwain**–State University of Iowa*
G. H. Ludwig***–State University of Iowa*

The purpose of this experiment was to extend the first measurements of the trapped radiation belt discovered with Explorers 1 and 3 and to provide measurements of artificially injected electrons from the three high-altitude nuclear detonations Argus I, II, and III. The experiment consisted of four separate radiation detectors and associated electronic circuitry. Detector A was a plastic scintillation counter shielded with 0.14 gm/cm^2 of aluminum over a conical collimator aperture which provided a trapezoidal angular response of 6° half angle which fell to zero at 19°. The detector was sensitive to electrons above about 700 kev and protons above 10 Mev. Detector B was a cesium iodide scintillation counter with an angular response similar to Detector A. However the shielding over the crystal consisted of 0.2 mg/cm^2 of aluminum and 0.8 mg/cm^2 of nickel. The anode current of the photomultiplier tube provided a measure of the total energy lost in the crystal by electrons with energies greater than 20 kev and protons with energies greater than 400 kev. Detector C was an Anton type 302 Geiger-Mueller tube which was shielded only by the satellite structure and the electronic components of the payload. This shielding varied from 1.2 to 5 gm/cm^2. This detector mainly measured electrons above 3 Mev in energy and protons above 30 Mev.

*Now called University of Iowa.
**Now with University of California, San Diego.
***Now at Goddard Space Flight Center.

Detector D was another 302 GM tube which was surrounded by a lead cylinder of 1.6 gm/cm^2 thickness with slightly thicker lead plugs on the two ends. This detector responded mainly to electrons greater than 5 Mev and protons greater than 40 Mev.

The counting rate data for detectors A, C, and D and the energy loss rate for detector B are time ordered on two magnetic tapes. These tapes are packed at a density of 556 bpi, in BCD mode, made on an IBM 7094.

Data are available for certain time intervals within the following time periods:

Detector A	July 26 to September 3, 1958
Detectors B, C, D	July 26 to September 18, 1958

Each logical tape record consists of the following quantities:

1. Time
2. Detector C and D counting rates
3. Detector A maximum, minimum, and average counting rates
4. Detector B maximum and minimum energy loss rates
5. Scalar magnetic field intensity (gauss)
6. McIlwain's L parameter (earth radii)
7. B/B_o
8. Latitude (degrees)
9. Longitude (degrees)
10. Altitude (km)

EXPLORER 6 - 1959 DELTA 1

Apogee	42 000 km	Period	12.7 hr
Perigee	250 km	Inclination	47°

Ionization Chamber/GM Tube Experiment

Investigators:

J. R. Winckler–University of Minnesota
R. Arnoldy*–University of Minnesota
R. A. Hoffman**–University of Minnesota

*Now with University of New Hampshire.
**Now at Goddard Space Flight Center.

An argon-filled ionization chamber and an Anton type 302 Geiger-Mueller tube were flown on the spin-stabilized satellite. The ionization chamber, which responded to protons ($E_p > 23.6$ Mev) and electrons ($E_e > 1.55$ Mev), failed after August 25, 1959, probably due to wear-out following a solar flare which produced a count rate in the chamber greater than 30 pulses per sec. The Geiger-Mueller tube, which was operational for 2 months, responded to protons ($E_p > 36.4$ Mev) and electrons ($E_e > 2.86$ Mev).

NSSDC has the following data available on 35-mm microfilm:

1. Tabulations of raw and corrected counting rates including date, stations, and universal time for August 7 to October 6, 1959

2. Plots of the ion chamber rate, Geiger-Mueller rate, and geocentric distance vs universal time for August 7 to October 6, 1959

3. Computer listings of the calibrated digital data for August 7 to October 2, 1959, which include the following:

   a. Date, station, and universal time
   b. Height, right ascension, declination, and east longitude
   c. Ion chamber and Geiger-Mueller rates

In addition, NSSDC has data in the following forms:

1. Sanborn oscillograms made from the tapes for August 7 to October 3, 1959, on 46 rolls of 35-mm microfilm

2. Computer listings of the uncalibrated digital data

A *Data Users' Note* (NSSDC 67-04) covering the reduction techniques and format of available data may be obtained from NSSDC.

Proportional Counter Telescope Experiment

Investigators:
J. A. Simpson–University of Chicago
C. Y. Fan–University of Chicago
P. Meyer–University of Chicago

The experimental apparatus was similar to the equipment on the Pioneer 5 space probe; namely, a wide-angle, triple coincidence counter telescope surrounded by 5 gm/cm^2 lead which detected protons with energies in excess of 75 Mev and electrons of more than 13 Mev. Bremsstrahlung caused by electrons in the energy range of 0.2–13 Mev were measured independently.

The following graphical and tabular data are available on two rolls of 35-mm microfilm for the periods indicated:

1. Graphs of counts vs time from the triple coincidence channel for the period of August 7 to September 10, 1959

2. Graphs of counts vs time from the single counter channel for the period of August 7 to October 6, 1959

3. Graphs of counts vs time for both the single and triple coincidence channels for the period of August 10 to October 6, 1959

4. Tabulations of estimated equatorial count rate for pitch angles from 0.4 to 1.4 at 1-min intervals for approximately 25-min periods when the satellite was near the equator. Data are available for the period of August 7 to September 30, 1959.

Data include:

a. Time of observation
b. Magnetic latitude
c. Geocentric range
d. Estimated equatorial count rate
e. Observed count rate
f. Ratio of B to B_o

5. Graphs of Climax neutron monitor data from August 8 to September 10, 1959

6. Tabulations of the calibrated data from the digital telemetry system of the satellite for the period of August 7 to October 2, 1959

Data include:

a. Time of observation
b. Longitude of the satellite
c. Geocentric range
d. Right ascension of the satellite
e. Declination of the satellite
f. Single channel count rate
g. Triple coincidence channel count rate

NSSDC also has:

1. Sanborn oscillograms, made from the tapes for August 7 to October 3, 1959, on 46 rolls of 35-mm microfilm

2. Computer listings of the uncalibrated digital data of the telemetry system for August 7 to October 2, 1959

Scintillation Counter Experiment

Investigators:
C. P. Sonett*–Space Technology Laboratory**
T. A. Farley***–Space Technology Laboratory**
A. Rosen–Space Technology Laboratory**

The detector consisted of a cylindrical plastic scintillator approximately 1 in. in diameter and 1/4 in. thick cemented to a Dumont 6467 photomultiplier tube. The detector was covered with a foil having a thickness of

*Now with Ames Research Center.
**Now TRW Systems Group.
***Now with UCLA.

3.3 mg/cm^2. An electronic bias was used in order to count only particles losing 100 kev or more of energy in the scintillator. The foil thickness, the permitted angle of penetration of the foils, and the electronic bias of 100 kev determined the minimum detectable energy, which was 200 kev for electrons and 2 Mev for protons.

The data are available in the form of 41 plots that cover the period of August 8 to September 10, 1959, and include:

1. Date, universal time, and orbit number
2. Count rate
3. Geomagnetic latitude and radial distance

Also available are:

1. Sanborn oscillograms that were made from the tapes for August 7 to October 3, 1959, on 29 rolls of 35-mm microfilm
2. Sanborn oscillograms that resulted from additional filtering of the analog magnetic tapes on 11 rolls of 35-mm microfilm
3. Computer listings of the uncalibrated and calibrated digital data from the telemetry system for August 7 to October 2, 1959

A *Data Users' Note* (NSSDC 67-18) covering the reduction techniques and format of available data may be obtained from NSSDC.

EXPLORER 11 - 1961 NU 1

Apogee	1786 km	Period	108.1 min
Perigee	486 km	Inclination	28.9°

Crystal Sandwich/Cerenkov Counter Experiment

Investigator:
G. P. Garmire–Massachusetts Institute of Technology

Charged particles were detected by a scintillator plastic, a NaI(Tl)/CsI(Tl) crystal sandwich, and a lucite Cerenkov detector in concert with photomultipliers. The energy thresholds for each detector, determined by the detector characteristics and the associated shielding, were as follows:

Detector	Electron	Proton
Scintillation Plastic (upper portion)	350 kev	3.5 Mev
Scintillation Plastic (lower portion)	400 kev	35 Mev
Crystal Sandwich	400 kev	75 Mev
Cerenkov	15 Mev	350 Mev

The detectors were directional; consequently different angles of incidence resulted in different thresholds.

The data are available on punched cards and on a card image magnetic tape with a density of 556 bpi. The time periods of the data are from April 28 to November 12, 1961.

Data include:

1. Universal time
2. Latitude, longitude, and altitude
3. B, L, and B_o
4. The count rate for each detector and for the coincidence pulses between the crystal sandwich and the Cerenkov detector

A *Data Users' Note* (NSSDC 68-04) covering the reduction techniques and format of available data may be obtained from NSSDC.

EXPLORER 12 - 1961 UPSILON 1

Apogee	77 300 km	Period	26.5 hr
Perigee	300 km	Inclination	33°

Charged Particle Detector Experiment

Investigators:
B. J. O'Brien*–State University of Iowa**
L. A. Frank–State University of Iowa**

The experiment was designed to measure the flux and energy of charged particles and cosmic rays and to determine their spatial and temporal distribution over the spacecraft orbit. The detectors included a shielded ($\sim$1 gm/cm^2 mica) Anton type 302 Geiger-Mueller tube, a magnetic spectrometer utilizing three thin-windowed (1.2 mg/cm^2 mica) Anton type 213 Geiger-Mueller tubes, and three cadmium sulfide crystals for measurements of the total energy flux of protons $E_p > 1$ kev and electrons $E_e > 200$ ev. The response of each detector was accumulated for 10.24 sec by the on-board experiment encoder, and the contents of the accumulators were telemetered at the end of each sampling interval. The encoder accumulators were time-shared so that each detector response was sampled once every 79 sec.

Counting rate data fully merged with orbital information and ordered chronologically for the entire period of usable telemetry coverage are available on three magnetic tapes. The data are packed at a density of 556 bpi in BCD mode, at five logical records per physical record with a logical record length of 342 characters.

Data are available for the period of August 16 to December 6, 1961.

*Now with Rice University.
**Now called University of Iowa.

Data include:

1. Time of observation
2. Geographic position of satellite
3. Geomagnetic position
4. Position relative to the sun
5. Counting rate

The same data are also available in graphic form.

A *Data Users' Note* (NSSDC 67-16) covering the reduction techniques and format of available data may be obtained from NSSDC.

ORBITING SOLAR OBSERVATORY (OSO 1) - 1962 ZETA 1

Apogee	595 km	Period	96 min
Perigee	550 km	Inclination	33°

Inner Van Allen Belt Experiment

Investigators:

Proton-Electron Analyzer, C. D. Schrader*-Livermore Radiation Laboratory
Solar Neutron Detector, W. H. Hess**-Livermore Radiation Laboratory

The proton-electron analyzer monitored the time and position variations of the fluxes of protons of energies greater than 1.5 Mev and electrons of energies greater than 110 kev. A single stilbene crystal on a single RCA type 6199 multiplier phototube was used as a scintillator to detect and separately count protons and electrons. The discrimination is accomplished by electronic pulse-shape discrimination and is based upon the fact that in certain scintillators protons and electrons produce fluorescent pulses with distinctly different decay times.

The neutron flux detector consisted of a boron trifluoride proportional counter enriched in boron 10 (B^{10} F_3) for measurement of neutron flux and background and a boron trifluoride proportional counter depleted in boron 10 (B^{11} F_3) for measurement of background radiation. The BF_3 counters were covered with about 1-1/2 in. of moderator to make the neutron count rate larger. This detector had a nearly constant efficiency from one kev to several Mev.

The majority of the data for the period of March 7 to May 15, 1962, are available in graphical form (one graph per orbit) on 19 rolls of microfilm. The following types of graphs are included:

$\log CR_{B10}$	vs time
$\log CR_{B11}$	vs time
$\log CR_{p}$	vs time
$\log CR_{E}$	vs time
$\log CR_{E/64}$	vs time

time vs altitude, latitude, longitude

*Now at Aerospace Corporation.
**Now at Manned Spacecraft Center.

$\log CR_{B10}$	vs L during day
$\log CR_{B10}$	vs L at night
$\log CR_{p}$	vs L during day
$\log CR_{p}$	vs L at night
$\log CR_{E}$	vs L during day
$\log CR_{E}$	vs L at night
$\log CR_{E/64}$	vs L during day
$\log CR_{E/64}$	vs L at night
$\log CR_{B10}$	vs angle of sun elevation

CR_{p}	vs B & L during day
CR_{p}	vs B & L at night
CR_{E}	vs B & L during day
CR_{E}	vs B & L at night
$CR_{E/64}$	vs B & L during day
$CR_{E/64}$	vs B & L at night

In addition, for some orbits, the following graphs are included:

CR_{p}	vs B & λ during day
CR_{p}	vs B & λ at night
CR_{E}	vs B & λ during day
CR_{E}	vs B & λ at night
$CR_{E/64}$	vs B & λ during day
$CR_{E/64}$	vs B & λ at night

$\log CR_{p}$	vs magnetic field angle during day
$\log CR_{p}$	vs magnetic field angle at night
$\log CR_{E}$	vs magnetic field angle during day
$\log CR_{E}$	vs magnetic field angle at night
$\log CR_{E/64}$	vs magnetic field angle during day
$\log CR_{E/64}$	vs magnetic field angle at night

TELSTAR 1 - 1962 ALPHA EPSILON 1

Apogee	5636 km	Period	157.7 min
Perigee	954 km	Inclination	45°

Charged Particle Detectors

Investigator:

W. L. Brown–Bell Telephone Laboratories

The Telstar 1 satellite carried a group of four detectors designed to measure the spatial distribution and time variation of trapped electrons and protons and crude properties of their energy distribution. The particle detectors were all diffused-silicon p-n junction devices – solid-state ionization chambers which give pulse responses proportional to the amount of energy deposited by an ionizing particle in the active volume of the semiconductor material.

Their energy ranges are:

Low-energy protons	2.4 - 25 Mev (in 9 ranges)
Medium-energy protons	26 - 34 Mev
High-energy protons	>50 Mev
Electrons	200 kev - 1 Mev

The data are contained on five binary magnetic tapes that were written with FORTRAN programs on an IBM 7094 under the control of the BE-SYS (Bell System) monitor at a density of 800 bpi. The tapes are file-structured and are sequential in time. The type and the length of the logical records contained in a given physical record are indicated by control words.

Data are available for the period of July 10, 1962, to February 21, 1963.

Data include:

1. Time of observation
2. Geographic position of satellite
3. Geomagnetic position, including B and L
4. Electron counting rates
5. Proton counting rates

EXPLORER 14 - 1962 BETA GAMMA 1

Apogee	98 533 km	Period	36.4 hr
Perigee	281 km	Inclination	33°

Trapped Particle Radiation Experiment

Investigators:

J. A. Van Allen–State University of Iowa*
L. A. Frank–State University of Iowa*
B. J. O'Brien**–State University of Iowa*

The objectives of this experiment were to obtain definitive values of the absolute intensities of geomagnetically trapped electrons and protons on comprehensive spatial and temporal bases, and to study the physical phenomena at and near the boundary of the magnetosphere. The detectors included three halogen-quenched Anton type 213 Geiger-Mueller tubes and a single Anton type 302 GM tube. The 213 tubes were designed to distinguish between low-energy electrons ($E \geqslant 40$ kev) and low-energy protons ($E \geqslant 500$ kev), and to determine the separate absolute integral intensities of electrons and protons. (See table on following page.) The 302 GM tube was used as a general monitor and for comparison with similar 302 detectors on Explorers 4, 7, and 12. The counts from each detector were accumulated for 10.24 sec and the contents of the accumulators were telemetered once each 76.8 sec.

Counting rate data ordered chronologically are available on 10 Data Set A (Master File) magnetic tapes or on two Data Set B (Science File) tapes. They are packed at 556 bpi, in BCD mode, 78 characters per logical record with 10 records in each physical block. The data tapes were made on an IBM 7094 computer.

*Now called University of Iowa.
**Now with Rice University.

Detector, Anton Type	Shielding	Penetrating Particles
213A	1.2 mg/cm^2 mica	Protons > 500 kev Electrons > 40 kev
213B	48 mg/cm^2 Al	Protons > 4.5 Mev Electrons > 230 kev
213C	1.2 mg/cm^2 mica plus sweeping magnet	Protons > 500 kev Electrons > 200 kev
302	265 mg/cm^2 Mg and 400 mg/cm^2 stainless steel	Protons > 23 Mev Electrons > 1.6 Mev

Data are available for the period of October 2, 1962, to August 11, 1963.

Data Set A includes:

1. Time
2. Data quality and time validity flags
3. Detector counting rate (counts/sec)

Data Set B includes:

1. Time
2. Radial distance (km)
3. Magnetic latitude (deg)
4. McIlwain's L parameter (earth radii)
5. Field strength (gamma)
6. Geocentric latitude and longitude (degrees)
7. Three-hour indices K_p
8. Three-hour indices K_p summed over 24 hours
9. Detector counting rate (log [counts/sec] + 1)

EXPLORER 15 - 1962 BETA LAMBDA 2

Apogee	17 300 km	Period	312 min
Perigee	310 km	Inclination	18°

Charged Particle Detectors

Investigator:
W. L. Brown–Bell Telephone Laboratories

The Explorer 15 satellite carried a group of six diffused-silicon p-n junction particle detectors. These are solid-state ionization chambers which give pulse responses proportional to the amount of energy deposited by an ionizing particle in the active volume of the semiconductor material. The effective area of each detector is ~0.04 cm^2. The approximate threshold energies of the three detectors for which data are available are as follows:

Detector	Electrons	Protons	Full Angular Aperture of Detector
I	0.5 Mev 2.8 Mev	2.1 Mev 4.0 Mev	20°
II	1.9 Mev	15 Mev	2π (20°)
III	2.9 Mev	22 Mev	2π (30°)

The data are contained on one binary magnetic tape that was written with FORTRAN programs on an IBM 7094 under the control of the BE-SYS monitor at a density of 800 bpi. The observed counting rates have been interpolated to obtain the fluxes at fixed values of L, and the interpolated data are on a file-structured tape. Each of the 62 files has an L value between 1.10 and 4.8, and the logical records are time-ordered within each file. The number of logical records in each physical record is indicated by control words.

The data cover the period of October 27, 1962, to January 1, 1963, and each logical record includes:

1. Time of observation
2. B and L
3. Detector counting rates
4. Angle between spin axis and B vector

Ion-Electron Experiment

Investigators:

L. R. Davis–Goddard Space Flight Center
J. Williamson–Goddard Space Flight Center

The purpose of this experiment was to measure particle fluxes, types, and energy as a function of direction, time, and position below, in, and above the Van Allen belts. The ion-electron scintillation detector consisted of powdered phosphor on a photomultiplier tube which was located behind a stepping absorber wheel. The dc current and pulse counting rates were measured simultaneously for each absorber position. The total energy flux was obtained for seven absorber thicknesses by measuring the photomultiplier dc current.

The ion detector was operative over the energy range of 100 kev to 1 Mev for protons with maximum counting rates of 10^4 counts/sec in each channel. The electron detector with a dynamic range of 10^5 was operative for electrons between 10 kev and 100 kev. For average photomultiplier voltage, the minimum detectable energy flux was 10^{-2} erg/sec. The total energy flux detector with a dynamic range of 10^5 was operative over the energy range of 30 kev to 1 Mev for protons, and 10 kev to 100 kev for electrons. For average values of photomultiplier voltage, the minimum detectable flux was 2×10^{-4} erg/sec.

The data are available on 18 magnetic tapes that are in the binary mode with odd-parity at a density of 556 bpi. The tapes were prepared by an IBM (7040/7094) DCS with each physical record consisting of 460 binary words. These data cover the period of October 28, 1962, to January 27, 1963.

Data include:

1. Time of observation and orbit number
2. Geographic position of satellite

3. Geomagnetic position, including B and L
4. Orientation information
5. Ion and electron detector count rate and current measurements

Charged Particle Experiment

Investigator:
C. E. McIlwain–University of California, San Diego

This experiment consisted of two plastic scintillation counters used to measure electrons and protons in the earth's radiation belts. Information about the electrons injected by the Starfish nuclear detonation was obtained, and observations of injections due to the Russian detonations in October and November 1962 were made. The omnidirectional detector was constructed by mounting a 0.4-cm-diameter sphere of plastic scintillator on a lucite light pipe which was attached to a photomultiplier tube. This arrangement was shielded by a hemispherical aluminum shell of 1.8 gm/cm^2 thickness with much heavier shielding over the back hemisphere. Protons between 40 to 110 Mev were measured by one discriminator level. The lower level discriminator measured pulses corresponding to energy losses in the crystal greater than 800 kev. The effective electron threshold given by McIlwain is 5 Mev.

The directional detector was another scintillation counter which viewed out perpendicular to the spin axis of the satellite through a specially constructed collimator which had an 8° half-angle conical field of view. The shielding over the aperture amounted to .049 gm/cm^2 of aluminum. The outputs from two separate discriminators were monitored. The higher level discriminator output was mainly used to provide a proton subtraction to the lower level discriminator output. Electron fluxes for energies greater than 0.5 Mev were obtained with this detector. The accumulation time of 9.3 sec corresponded to averages over 7.6 revolutions of the satellite. Subsequently the spin averaged counts were reduced by McIlwain to unidirectional fluxes perpendicular to the magnetic field line.

The data are available on six time ordered magnetic tapes that are in binary mode with odd-parity at a density of 556 bpi. The tapes were prepared on a CDC 3600. Each logical record consists of twelve 48-bit words; 10 logical records are blocked to form a physical record. A logical record contains the following information:

1. Time
2. Detector counting rate
3. Scalar magnetic intensity, B (gauss)
4. McIlwain's L parameter
5. B/B_o
6. Right ascension & declination of the B vector
7. Longitude (degrees)
8. Latitude (degrees)
9. Altitude (km)
10. Two flag words containing housekeeping data and noise indicators

Fairly complete time coverage for the time period October 26, 1962, to January 30, 1963, are available. These tapes are also being converted to an IBM compatible format where the quantities will appear as 36-bit words. Only 36 bits of the original 96 bits for flags and housekeeping will be retained.

RELAY 1 - 1962 BETA UPSILON 1

Apogee	7421 km	Period	185 min
Perigee	1317 km	Inclination	47.5°

Charged Particle Detectors

Investigator:
W. L. Brown–Bell Telephone Laboratories

The Relay 1 satellite carried two detectors designed to measure the spatial distribution and time variation of trapped electrons and protons and crude properties of their energy distribution. The particle detectors were diffused-silicon p-n junction devices. These are solid-state ionization chambers which give pulse responses proportional to the amount of energy deposited by an ionizing particle in the active volume of the semiconductor material.

Their overall energy ranges are:

Protons	2.5 - 25 Mev
Electrons	1.25 - 2 Mev

The data are contained on two binary magnetic tapes that were written with FORTRAN programs on an IBM 7094 under the control of the BE-SYS monitor at a density of 800 bpi. The two file-structured tapes consist of one electron L-table tape and one proton L-table tape. The first file of each tape is an identification record, and the subsequent 61 files contain the data divided into L slices that cover the interval of 1.000 to 6.999.

The number and type of logical records that are contained in a given physical record are indicated by control words.

Data cover the period of December 13, 1962, to March 31, 1964, and include:

1. Time of observation
2. B and L
3. Proton and electron intensities

A *Data Users' Note* (NSSDC 67-11) covering the reduction techniques and format of available data may be obtained from NSSDC.

Proton-Electron Detector Experiment

Investigators:
C. McIlwain*–State University of Iowa**
R. W. Fillius*–State University of Iowa**

The spatial and energy distributions of geomagnetically trapped particles were investigated by four charged particle detectors and three pulse height analyzers. A 0.932-cm diameter sphere of plastic scintillator served as an omnidirectional detector. Its threshold energies were 3.7 Mev for electrons and 35 Mev for protons. Three unidirectional detectors were mounted perpendicular to the spin axis of the satellite. They were gated by a magnetometer to record data only when they pointed within 10° of the plane perpendicular to the local magnetic field vector. This corresponded to an approximate measurement of the flux of locally mirroring particles. The trio consisted of:

*Now at University of California, San Diego.
**Now called University of Iowa.

Detector	Geometric Factor in cm^2 ster	Proton Energy Range
Silicon Surface Barrier Diode	0.0136	1.1 to 14 Mev
Two Si-Li Drift Diodes	0.22	18.2 to 63 Mev
Plastic Scintillator Cylinder	0.0027	>5.2 Mev

The observed proton fluxes for each energy interval of the detectors were interpolated in time to every crossing of selected magnetic shells. For each shell, coefficients were found for polynomials that related the strength of the earth's magnetic field and the time to the measured flux. A FORTRAN subroutine is available that returns the proton flux in the desired energy interval for a specified point of space. The subroutine utilizes the polynomial coefficients and proceeds by interpolation on the counting rates calculated at a set of points of the L grid. The energy intervals, their associated ranges of L, and the date the data were corrected to are:

Energy Interval in Mev	L in Earth Radii	Date
1.1 to 14	1.5 to 4.2	Jan. 1, 1963
1.6 to 7.1	1.5 to 4.2	Jan. 1, 1963
2.25 to 4.7	1.5 to 4.2	Jan. 1, 1963
>5.2	1.7 to 3.0	Jan. 1, 1963
18.2 to 25	1.3 to 3.0	Jan. 1, 1963
25 to 35	1.3 to 2.9	Jan. 1, 1963
35 to 63	1.4 to 2.9	Jan. 1, 1963
>35	1.75 to 2.9	Jan. 1, 1963

TELSTAR 2 - 1963 13A

Apogee	10 803 km	Period	225 min
Perigee	972 km	Inclination	43°

Charged Particle Detectors

Investigator:

W. L. Brown–Bell Telephone Laboratories

The Telstar 2 satellite carried a group of four detectors designed to measure the spatial distribution and time variation of trapped electrons and protons and crude properties of their energy distribution. The particle detectors were all diffused-silicon p-n junction devices – solid-state ionization chambers which give pulse responses proportional to the amount of energy deposited by an ionizing particle in the active volume of the semiconductor material.

Their energy ranges are:

Low-energy protons	2 - 30 Mev (in 9 ranges)
Medium-energy protons	18 - 28 Mev
High-energy protons	>50 Mev
Electrons	750 kev - 2 Mev

The data are contained on eight binary magnetic tapes that were written with FORTRAN programs on an IBM 7094 under the control of the BE-SYS monitor at a density of 800 bpi. The tapes have a file structure that is sequential in time. The type and the length of the logical records contained in a given physical record are indicated by control words.

Data are available for the period of May 6, 1963, to May 6, 1965.

Data include:

1. Time of observation
2. Geographic position of satellite
3. Geomagnetic position, including B and L
4. Electron counting rates
5. Proton counting rates

B. Solar and Galactic Cosmic Rays

EXPLORER 7 - 1959 IOTA 1

Apogee	1090 km	Period	101 min
Perigee	555 km	Inclination	50°

Heavy Primary Cosmic-Ray Experiment

Investigators:
M. Pomerantz–Bartol Research
G. Groetzinger–Martin Company
P. Schwed–Martin Company

A pulse ionization chamber was used to measure temporal variations in the flux and magnetic rigidity spectrum of primary heavy nuclei of atomic number $Z \geqslant 6$ during a period when solar modulation effects were most pronounced. The instrument consisted of an extruded cylinder, 11 cm in diameter and 11 cm long, fabricated from magnesium alloy of a 2.5-mm thickness to which were welded end disks of the same material, of a 3-mm thickness. A length of 0.25-mm Kovar wire was held in the center by a Kovar seal in each end piece. The chamber was filled with argon at 9 atmospheres pressure.

Counting rate data are available on 17 238 punched cards or one reel of magnetic tape prepared on an IBM 1401 system, in BCD mode, even-parity, at a density of 556 bpi.

Data are available for the periods:

October 13 to 24, 1959
November 1, 1959, to March 15, 1960
April 12 to May 30, 1960

Data include:

1. Time of observation
2. Geographic position of satellite

3. Counting rates
4. Counts for $Z \geqslant 6$ particles
5. Cutoff rigidities
6. Related solar phenomena

A *Data Users' Note* (1965) covering the reduction techniques and format of available data may be obtained from NSSDC.

PIONEER 5 - 1960 ALPHA 1

Aphelion	0.993 AU	Period	311.64 days
Perihelion	0.806 AU	Inclination	3.35°

Ionization Chamber/GM Tube Experiment

Investigators:
J. R. Winckler–University of Minnesota
R. Arnoldy*–University of Minnesota
R. A. Hoffman**–University of Minnesota

An argon-filled ionization chamber and an Anton type 302 Geiger-Mueller tube were flown on the spin-stabilized deep space probe, which was launched inward toward the orbit of the planet Venus. The ionization chamber responded to protons ($E_p > 25$ Mev) and electrons ($E_e > 1.55$ Mev). The Geiger-Mueller tube responded to protons ($E_p > 36.4$ Mev) and electrons ($E_e > 2.86$ Mev). Both instruments were very similar to those flown on Explorer 6. No correction was applied to the data for secondary particles produced by cosmic rays.

The following tabular data are available on two rolls of 35-mm microfilm for the period from March 11 to April 29, 1960, after which the data were too noisy to utilize:

1. Chronologically arranged tabulations of station telemetry data for Manchester, Singapore, and Hawaii. These data contain the following information:

   a. Geocentric and heliocentric distance (km)
   b. Right ascension and declination of probe (deg)
   c. Ionization chamber reading (counts)
   d. Geiger-Mueller tube reading (counts)

2. Chronologically arranged tabulations of calculated data from all stations. These 16 worksheets contain the following information:

   a. Time of observation (UT)
   b. Receiving station
   c. Counter readings (counts)
   d. Uncorrected count rate
   e. Corrected Geiger-Mueller tube count rate
   f. Normalized and corrected ionization chamber count rate

*Now with University of New Hampshire.
**Now at Goddard Space Flight Center.

The following data are also available from NSSDC:

1. One hundred ninety-three station analog magnetic tapes for March 11 to July 4, 1960

2. Sanborn oscillograms made from the tapes for March 11 to July 4, 1960, on 12 rolls of 35-mm microfilm

3. Computer listings of the uncalibrated digital telemetered data for March 11 to May 15, 1960

A *Data Users' Note* (NSSDC 67-10) covering the reduction techniques and format of available data may be obtained from NSSDC.

Proportional Counter Telescope Experiment

Investigators:
J. A. Simpson–University of Chicago
C. Y. Fan–University of Chicago

The experimental apparatus was similar to the equipment on the Explorer 6 satellite; namely, a wide-angle, triple coincidence counter telescope surrounded by 5 gm/cm^2 lead which detected protons with energies in excess of 75 Mev and electrons of more than 13 Mev. Bremsstrahlung caused by electrons in the energy range of 0.2 to 13 Mev was measured independently.

Data include:

1. Five rolls of 35-mm microfilm containing the following graphical and tabular data:

   a. Graphs of the triple counter and single counter channel data and their ratio for March 11 to May 10, 1960
   b. Tabulations of the uncalibrated digital data for March 11 to May 10, 1960, that include time and single and triple count rates

2. Twelve rolls of 35-mm microfilm containing the Sanborn oscillograms made from the analog tapes

3. Computer listings of the calibrated digital data from the telemetry system for March 11 to May 15, 1960, as follows:

   a. Date, station, and universal time
   b. Radial distances of the satellite from the earth and the sun
   c. Ascension, declination, and distance from the ecliptic plane
   d. Triple and single counting rates

EXPLORER 18 - 1963 46A

Apogee	196 960 km	Period	93.5 hr
Perigee	192 km	Inclination	33.3°

Cosmic-Ray Experiment

Investigators:
F. B. McDonald–Goddard Space Flight Center
G. H. Ludwig–Goddard Space Flight Center

Investigators: (continued)

V. K. Balasubrahmanyan–Goddard Space Flight Center

T. L. Cline–Goddard Space Flight Center

The composition and the degree of isotropy of cosmic rays were investigated by a combination of two instruments. The first consisted of two CsI(T1) crystals, a 512-channel pulse height analyzer, and a plastic scintillator. Particles that traversed the first crystal, but stopped in the second, were pulse-height analyzed. The coincidence count required particles which were $Z < 3$ positive ions with 15 to 80 Mev per nucleon or 3 to 12.5 Mev electrons. Particles of higher energies penetrated to the plastic scintillator and caused a coincidence count, which was discounted. The acceptance solid-angle of this scintillator telescope was 0.65 ster. The second instrument consisted of four pancake-type halogen quenched Geiger-Mueller counters, two parallel, and two perpendicular to the spin axis of the satellite. The geometric factor of each counter was 5.95 cm^2 ster. The instruments' threshold coincidence energies for protons and electrons were:

Parallel telescope	70 Mev and 6.5 Mev
Perpendicular telescope – thin wall	65 Mev and 6 Mev
Perpendicular telescope – thick wall	110 Mev and 14 Mev

Data are available on one binary magnetic tape with a density of 556 bpi made with an IBM 7040/7094 DCS. All data for one day are contained in a logical record of 652 data words. The tape is blocked with a physical record length of 460 words. Data are available from November 27, 1963, to May 26, 1964, and include:

1. Time
2. Average height
3. Scintillator telescope and Geiger counter hourly average rates
4. Error in hourly rates

Solar and Galactic Protons Experiment

Investigators:

J. A. Simpson–University of Chicago

G. Gloeckler–University of Chicago

C. Y. Fan–University of Chicago

A charged particle telescope was used to investigate the differential spectrum and the total energy of $Z \leqslant 6$ nuclei. The detector consisted of four solid-state scintillators, two Au-Si photodiodes, and a photomultiplier tube. The arrangement of these components also permitted the instrument to measure both electron and positive ion fluxes. An aluminized mylar window gave the system threshold energies of 0.9 Mev for protons and 30 kev for electrons. The first two scintillators were Au-Si, while the third detector was a CsI(T1) crystal set inside the fourth detector, a plastic scintillator cup. The geometrical factor of the telescope was 0.85 cm^2 ster, and its main axis was perpendicular to the spin axis of the satellite. The four detectors were coupled with two pulse height analyzers of six intervals each that were activated by coincidence counts. The energies a proton needed for coincidence were:

For the first two detectors	6.5 to 190 Mev
For the first three detectors	19 to 190 Mev
For all four detectors	90 to 190 Mev

The instrument also registered the flux of particles with an energy of 250 to 500 Mev per nucleon through pulse height analysis.

Data for the period November 27, 1963, to June 9, 1964, are contained on six magnetic tapes. These tapes were written at a density of 556 bpi in non-FORTRAN IBM 7090 binary format (odd-parity). Each physical record is 804 words in length and consists of six logical records of 134 words each.

Data include:

1. Date
2. Universal time
3. Counts of the first Au-Si scintillator
4. Two, three, and four scintillator coincidence counts
5. Pulse height analysis data

A *Data Users' Note* (NSSDC 67-37) covering the reduction techniques and format of available data may be obtained from NSSDC.

Energetic Particles Experiment

Investigators:

K. A. Anderson–University of California, Berkeley
H. K. Harris–University of California, Berkeley

An argon-filled ionization chamber and two shielded Anton type 213 Geiger-Mueller tubes were used as charged particle detectors. The ionization chamber measured fluxes of protons with energies above 17 Mev and electrons with energies above 1 Mev. One of the Geiger-Mueller tubes was directed toward an .008-in.-thick gold foil designed to scatter electrons into the detector's mica window. Electrons >45 kev penetrated to the detector through the window. The second Geiger-Mueller tube has no window and served as a background detector. Its threshold energies were 52 Mev for protons and 6 Mev for electrons.

The data available cover the period of November 27, 1963, to May 23, 1964, and are on two magnetic tapes that were written by an IBM 360 system on 7-track tape in BCD mode with even-parity at a density of 800 bpi. Each physical record is 1032 characters long and consists of 24 index characters and 18 logical records of 56 characters each. Both tapes are file-structured and include:

1. Date
2. Universal time
3. Optical aspect data
4. Electron detector counts
5. Background detector counts
6. Ionization chamber counts

A *Data Users' Note* (NSSDC 67-38) covering the reduction techniques and format of available data may be obtained from NSSDC.

EXPLORER 21 - 1964 60A

Apogee	101 940 km	Period	34.9 hr
Perigee	196 km	Inclination	33.5°

Energetic Particles Experiment

Investigator:
K. A. Anderson–University of California, Berkeley

An argon-filled ionization chamber and two shielded Anton type 213 Geiger-Mueller tubes were used as charged particle detectors. The ionization chamber measured fluxes of protons with energies above 17 Mev and electrons with energies above 1 Mev. One of the Geiger-Mueller tubes was directed toward an .008-in.-thick gold foil designed to scatter electrons into the detector's mica window. Electrons >45 kev penetrated to the detector through the window. The second Geiger-Mueller tube looked into space through a 60° full-angle cone. Its threshold energies were 500 kev for protons and 40 kev for electrons.

Data are available from October 4, 1964, to September 24, 1965, on one magnetic tape. The tape is BCD, 7-track, written on an IBM 360 system at a density of 800 bpi. Each physical record is 1032 characters long and consists of 24 index characters and 18 logical records of 56 characters each.

Data include:

1. Date
2. Universal time
3. Optical aspect
4. Electron detector counts
5. Background detector counts
6. Ionization chamber counts

C. Plasma Measurements

EXPLORER 10 - 1961 KAPPA 1

Apogee	233 000 km	Period	112 hr
Perigee	161 km	Inclination	33°

Plasma Probe Experiment

Investigators:
H. Bridge–Massachusetts Institute of Technology
F. Scherb*–Massachusetts Institute of Technology
B. Rossi–Massachusetts Institute of Technology
R. Talbot–Massachusetts Institute of Technology

A Faraday cup with four plane grids was used as a large solid angle detector of low-energy protons. A pulsating retarding voltage applied to one grid allowed a measurement of the flux of those protons whose energies were below a specified value which was varied in six steps up to a maximum of 2300 ev. A bias voltage applied to another grid repelled plasma electrons and suppressed spurious signals caused by photoelectric emission. The pulsating signals from the cup passed through a compression amplifier, were detected, and were telemetered in real time to the earth. The effective area of the detector was 18 cm^2, and the dynamic range of the entire system allowed

*Now with University of Wisconsin.

measurements from 6×10^6 to 6×10^{10} particles/cm^2/sec. Because of the rotation of the vehicle, the shape of the reconstructed signal as a function of time gave information on the arrival direction of the protons. The plasma probe equipment consumed a steady power of 20 milliwatts plus 20 milliwatts based on a 3% duty cycle.

The plasma telemetry signal consisted of a frequency shift with a maximum range of 2000 cps. These data were read in by an IBM 709, analyzed with a 1000-tooth comb filter with teeth separated by 2 cps, and displayed on a cathode-ray tube plotter. The plots are available on three rolls of 35-mm microfilm. A calibration curve is available to convert from frequency shift to current input to the amplifier.

The data cover most of the 52 hr of data obtained from Explorer 10, starting at approximately 15 hr 30 min, March 25, 1961.

Data include:

1. Time of observation
2. Vertical lines indicating the closest approach of the plasma probe cup normal to the vehicle-sun line
3. Energy step at which data were taken
4. Frequency shift
5. Calibration curve needed to convert to current input to the input amplifier

A *Data Users' Note* (NSSDC 67-05) covering the reduction techniques and the format of available data may be obtained from NSSDC.

MARINER 2 - 1962 ALPHA RHO 1

Solar Wind Spectrometer

Investigators:
M. Neugebauer–Jet Propulsion Laboratory
C. W. Snyder–Jet Propulsion Laboratory

Mariner 2 carried a cylindrical electrostatic analyzer that separated positively charged ions according to their energy per unit charge. The deflection plates, separated by 1.3 cm, had an angular length of 120° with an r_2/r_1 ratio of 1.134. The analyzer had an entrance aperture of 5.0 cm^2, which was rectangular in shape, such that the angular acceptance for charged particles in two perpendicular planes was approximately equal. A programmer and a high-voltage sweep amplifier applied a balanced potential to the plates of the analyzer. This voltage was varied in an ascending sequence of 10 values followed by a zero reading and a calibration reading. An electrometer measured the current from the charge collector at the output of the analyzer.

The spacecraft orientation was controlled by an attitude stabilization system, which kept the entrance aperture of the spectrometer pointed to within 0.1° of the center of the sun. Until September 3, 1962, the spacecraft slowly rolled about the sun-probe line; thereafter, the sun-probe-earth plane remained fixed in the spacecraft.

Data are available from NSSDC for the periods August 29 to October 31, 1962, and November 8 to December 30, 1962, in either a reduced or analyzed state. NSSDC can supply either type of data on microfilmed computer printout (tabular form) or in binary form on a single 1/2-in. magnetic tape. Tape density of the reduced data tape is 800 bpi; tape density of the analyzed data tape is 556 bpi.

Reduced data include:

1. Frame count (one frame = one complete cycle of 12 plasma readings)
2. Day number
3. Time in hours, minutes, and seconds at the start of the frame
4. Two electrometer output numbers, one for each of two consecutive channels

Analyzed data include:

1. A description of the model of the solar wind used for data reduction
2. Frame count
3. Day number
4. Time at the start of the frame, in seconds from the start of the day
5. Velocity of solar wind
6. Proton temperature
7. Densities of alpha particle and proton components of the solar wind
8. A parameter "h" to indicate how well the observations fit the model

EXPLORER 18 - 1963 46A

Apogee	196 960 km	Period	93.5 hr
Perigee	192 km	Inclination	33.3°

Solar Wind Protons Experiment

Investigators:
J. H. Wolfe–Ames Research Center
R. W. Silva–Ames Research Center

A curved plate electrostatic probe was used to detect and analyze the positive ion component of the incident plasma. The instrument consisted of two concentric quadrispherical plates with an aperture of 0.5 cm^2. The plates had a mean radius of curvature of 3.0 cm and were 0.25 cm apart. A 14-step cyclic staircase voltage that varied from 25 to 16 000 ev was applied across the plates. The small separation of the analyzer plates allowed only particles in a narrow energy band for each analyzer plate voltage to reach the collector. The probe's sensitivity range for singly charged positive ions was 3×10^5 to 1×10^{10} cm^{-2} sec^{-1}. The satellite's equatorial plane was divided into three sectors by use of the optical aspect sensor and the spin rate of the satellite. The flux in the designated sector was sampled at one analyzer plate potential per revolution of the satellite. After 14 revolutions the complete staircase voltage had cycled, and the process was repeated for the next sector. The total time taken for a complete scan was 5 min and 28 sec and was determined by telemetry requirements.

Data available cover the periods November 28, 1963, to March 22, 1964, and March 31 to April 3, 1964, which correspond to orbits one through 30 plus orbit 33. The data are contained on 248 analog graphs, each bearing the following information:

1. Date of observation
2. Universal time
3. Orbit number
4. Energy level – either 600, 1700, 2970, or 3740 ev per unit charge
5. Ion flux converted to normal incidence flux for each sector
6. Geocentric distance
7. Scan number

A *Data Users' Note* (NSSDC 67-35) covering the reduction techniques and format of available data may be obtained from NSSDC.

Retarding Potential Analyzer

Investigators:
G. P. Serbu–Goddard Space Flight Center
R. Bourdeau–Goddard Space Flight Center

A charged particle trap of planar geometry analyzed the spatial and energy distributions of both positive ions and electrons with energies below 100 ev. The instrument had an outside 5-cm^2 aperture covered by a fine wire mesh designed to pass 95% of the light. This aperture, combined with the related retarding grid and collector, provided a view angle of 5 ster. The axis of the trap was perpendicular to the spin axis of the satellite. The potential of the tungsten surface, which was electrically connected to the aperture grid, was set at ±30 or ±100 volts. During each of these four modes of operation, the potential of the retarding grid was changed in 15 equal steps from 0 to ±28 or ±100 volts, respectively. This permitted investigation of the 0- to 30-ev and the 0- to 100-ev energy spectrum for both electrons and positive ions. Each individual 15-step spectrum analysis was accomplished within 5.4 sec.

Data available include the negative current measurements obtained from 0327 to 1140 UT on November 27, and a total of four measurements on November 28 and 30, 1963. Also present are the positive current measurements obtained from 0001 to 0839 hr on November 27, 1963. All data are contained on 99 sheets of semilogarithmic graph paper each of which includes:

1. Day
2. Universal time
3. Current
4. Retarding potential
5. Height above the earth

A *Data Users' Note* (NSSDC 67-36) covering the reduction techniques and format of available data may be obtained from NSSDC.

EXPLORER 21 - 1964 60A

Apogee	101 940 km	Period	34.9 hr
Perigee	196 km	Inclination	33.5°

Solar Wind Protons Experiment

Investigator:
J. H. Wolfe–Ames Research Center

A curved plate electrostatic probe was used to detect and analyze the positive ion component of the incident plasma. The instrument consisted of two concentric quadrispherical plates with an aperture of 0.5 cm^2. The plates had a mean radius of curvature of 3.0 cm and were 0.25 cm apart. A 12-step cyclic staircase voltage that varied from 700 to 8000 ev was applied across the plates. The probe's sensitivity range for singly charged positive ions was 3×10^5 to 1×10^{10} ions cm^{-2} sec^{-1}. The satellite's equatorial plane was divided into three sectors by use of the optical aspect sensor and the spin rate of the satellite. The flux in the designated sector was sampled at one analyzer plate potential per revolution of the satellite. After 12 revolutions the complete staircase voltage had

cycled, and the process was repeated for the next sector. The total time taken for a complete scan was approximately 5 min and was determined by telemetry requirements.

Data available cover the period October 3 to December 23, 1964, which corresponds to orbits 1 - 57. The data are contained on microfilmed graphs, each containing the following information:

1. Date of observation
2. Universal time
3. Orbit number
4. Sector number
5. Voltage level
6. Peak collector current
7. Geocentric distance
8. Scan number

D. General Particle Measurements

PIONEER 1 - 1958 ETA 1

No orbit achieved.
Maximum height: 113 137 km

Ionization Chamber Experiment

Investigators:
C. P. Sonett*–Space Technology Laboratory**
A. Rosen–Space Technology Laboratory**

The ionization chamber consisted of an aluminum-walled vessel filled with spectroscopically pure argon to a pressure of 13.6 atmospheres at 20°C. The volume of the chamber was 43 cm^3; the areal density of the cylindrical walls was 400 mg/cm^2; and the areal density of the ends was 1200 mg/cm^2. In the interior of the chamber, a wire was coaxial with the cylindrical wall. The wire was insulated from the walls of the chamber, and an electrical potential of approximately 100 v was placed across the chamber. The current from the ion chamber was then applied to the input of an electrometer tube circuit. The energy range of the detector was 0.5 to 10^6 roentgens/hr of ionizing radiation.

Although the objective of a lunar orbit was not achieved, data were received for the lifetime of the flight, October 11 to 13, 1958. The payload reached a maximum altitude of 113 137 km.

Data were recorded at the Manchester, Hawaii, and Singapore ground stations on analog magnetic tapes. NSSDC has the analog tapes and the Sanborn oscillograms made from them. The oscillograms are plots of frequency versus time for each telemetry channel and are available on two rolls of 35-mm microfilm ordered by station and time. Also available are calibration curves which permit recovery of the radiation levels observed from the oscillograms.

A *Data Users' Note* (NSSDC 68-05) covering the reduction techniques and format of available data may be obtained from NSSDC.

*Now with Ames Research Center.
**Now TRW Systems Group.

EXPLORER 7 - 1959 IOTA 1

Apogee	1090 km	Period	101 min
Perigee	555 km	Inclination	50°

Radiation and Solar Proton Experiment

Investigators:

J. A. Van Allen–State University of Iowa*
G. H. Ludwig**–State University of Iowa*
H. Whelpley–State University of Iowa*
L. A. Frank–State University of Iowa*

The detectors were two Geiger-Mueller tubes, one an Anton type 302 and the other an Anton type 112. They counted protons with energies of 20 and 30 Mev and electrons above 1 and 3 Mev, respectively; as well as the bremsstrahlung from electrons of energies above about 30 and 80 kev, respectively.

Counting rate data are available on fourteen 2400-ft reels of magnetic tape in BCD mode with even-parity at a density of 556 bpi. Each logical record is 114 characters long. Data are available for the period of October 13, 1959, to February 28, 1961.

Data include:

1. Time of observation
2. Time of middle of observation
3. Geographic position of satellite
4. Geomagnetic position
5. Receiving station
6. Count rate
7. Detector number

A *Data Users' Note* (NSSDC 67-01) covering the reduction techniques and format of available data may be obtained from NSSDC.

E. Magnetic Measurements

PIONEER 1 - 1958 ETA 1

No orbit achieved.
Maximum height: 113 137 km

Search-Coil Magnetometer Experiment

Investigator:

C. P. Sonett***–Space Technology Laboratory†

*Now called University of Iowa.
**Now at Goddard Space Flight Center.
***Now with Ames Research Center.
†Now TRW Systems Group.

A search-coil magnetometer was flown on Pioneer 1 to measure the distant geomagnetic and interplanetary magnetic fields. The magnetometer consisted of a coil of 30 000 turns of No. 40 copper wire wound on a nickel-iron alloy core. The length-to-diameter ratio of the core was 40:1. The coil extended over the center 2 in. of the 10-in. core material. The coil was fixed in the vehicle with its plane collinear with the spin axis. Therefore, only the component of the magnetic field perpendicular to the spin axis of the vehicle was measured. The emf generated by the coil was applied to an amplifier having a center frequency of 2.0 Hz. The energy range of the instrument was approximately 10^{-5} to 2×10^{-2} gauss.

Although the objective of a lunar orbit was not achieved, usable data were received for two brief periods on October 11, 1958, when the spacecraft was in the intervals 3.7 to 7, and 12.3 to 14.8 geocentric earth radii, latitude 35°N to 5°N.

Data were recorded at the Manchester, Hawaii, and Singapore ground stations on analog magnetic tapes and, subsequently, on Sanborn oscillograms. The oscillograms are plots of frequency vs time for each telemetry channel and are available on two rolls of 35-mm microfilm. Plots of the magnetometer data are available on one roll of 35-mm microfilm and include:

1. Component of the magnetic field perpendicular to the satellite spin axis vs time
2. Change in phase angle vs time
3. Cumulative change in phase angle vs time

EXPLORER 6 - 1959 DELTA 1

Apogee	42 000 km	Period	12.7 hr
Perigee	250 km	Inclination	47°

Search-Coil Magnetometer Experiment

Investigators:

C. P. Sonett*–Space Technology Laboratory**
E. J. Smith***–Space Technology Laboratory**
D. L. Judge***–Space Technology Laboratory**
P. J. Coleman†–Space Technology Laboratory**

A search-coil magnetometer was flown on Explorer 6 to measure the distant geomagnetic and interplanetary magnetic fields. The magnetometer consisted of a coil of 30 000 turns of No. 40 copper wire wound on a nickel-iron alloy core. The length-to-diameter ratio of the core was 40:1. The coil extended over the center 2 in. of the 10-in. core material. The coil was fixed in the vehicle with its plane collinear with the spin axis. Therefore, only the component of the magnetic field perpendicular to the spin axis of the vehicle was measured. The emf generated by the coil was applied to an amplifier having a center frequency of 2.0 Hz. The range of the instrument was approximately 10^{-5} to 2×10^{-2} gauss.

The data are available on 50 plots that cover the period of August 8 to October 10, 1959, and include:

1. Date, universal time, and orbit number
2. Magnetic field amplitude and phase

*Now with Ames Research Center.
**Now TRW Systems Group.
***Now at USC.
†Now at UCLA.

In addition, NSSDC has:

1. Sanborn oscillograms, made from the tapes for August 7 to October 3, 1959, on 29 rolls of 35-mm microfilm

2. Sanborn oscillograms that resulted from additional filtering of the tapes on 11 rolls of 35-mm microfilm

3. Calibration data for the magnetometer

4. Computer listings of the uncalibrated and calibrated digital data from the telemetry system for August 7 to October 2, 1959

A *Data Users' Note* (NSSDC 67-31) covering the reduction techniques and format of available data may be obtained from NSSDC.

VANGUARD 3 - 1959 ETA 1

Apogee	3750 km	Period	130 min
Perigee	510 km	Inclination	33°

Proton Precessional Magnetometer Experiment

Investigator:
J. P. Heppner–Goddard Space Flight Center

The proton precessional magnetometer measured the magnetic fields through detection of the rate at which protons precessed about the magnetic field. The sensing head of the magnetometer consisted of a 600-turn 6 mh 4-in. solenoid wound on a 1-in. diameter cylinder filled with normal hexane. The polarization current was 6 amperes.

Digitized magnetic field data, consisting of one reel of magnetic tape containing some 4326 data readouts, time and positional data, and computed reference field data, are available for the period of September 18 to December 11, 1959. The tape is in the BCD mode with a density of 556 bpi and a physical record length of 84 characters.

Data include:

1. Time of middle of observation
2. Geographic position of the satellite
3. Tape number as designated by each station
4. Minitrack station code name
5. Qualitative figure attached to each observation
6. Standard deviation of observation in gammas
7. Average scalar magnetic field in gammas

A *Data Users' Note* (NSSDC 67-26) covering the reduction techniques and format of available data may be obtained from NSSDC.

PIONEER 5 - 1960 ALPHA 1

Aphelion	0.993 AU	Period	311.64 days
Perihelion	0.806 AU	Inclination	3.35°

Search-Coil Magnetometer Experiment

Investigators:

C. P. Sonett*–Space Technology Laboratory**
D. L. Judge***–Space Technology Laboratory**
P. J. Coleman†–Space Technology Laboratory**

A search-coil magnetometer was flown on Pioneer 5 to measure the distant geomagnetic and interplanetary magnetic fields. The magnetometer consisted of a coil of 30 000 turns of No. 40 copper wire wound on a nickel-iron alloy core. The length-to-diameter ratio of the core was 40:1. The coil extended over the center 2 in. of the 10-in. core material. The coil was fixed in the vehicle with its plane collinear with the spin axis. Therefore, only the component of the magnetic field perpendicular to the spin axis of the vehicle was measured. The emf generated by the coil was applied to an amplifier having a center frequency of 2.0 Hz. The range of the instrument was approximately 10^{-5} to 2×10^{-2} gauss.

Data are available for the period of March 11 to May 6, 1960, in the form of one volume of tables and graphs that include:

1. Date and universal time
2. Telemetry bit readings
3. Magnetic field amplitude
4. Statistical analyses and calibration data

Data available at NSSDC also include:

1. Sanborn oscillograms made from the tapes for March 11 to July 4, 1960, on nine rolls of 35-mm microfilm
2. Calibration curves needed to recover the magnetic field data from the oscillograms
3. Computer listings of the uncalibrated digital telemetered data for March 11 to May 15, 1960

EXPLORER 10 - 1961 KAPPA 1

Apogee	233 000 km	Period	112 hr
Perigee	161 km	Inclination	33°

Rubidium Vapor Magnetometer Experiment

Investigators:

J. P. Heppner–Goddard Space Flight Center
T. L. Skillman–Goddard Space Flight Center
C. S. Scearce–Goddard Space Flight Center
N. F. Ness–Goddard Space Flight Center

*Now with Ames Research Center.
**Now TRW Systems Group.
***Now at USC.
†Now at UCLA.

Explorer 10 carried a self-oscillating rubidium vapor magnetometer and two fluxgate, saturable-core magnetometers. The rubidium vapor magnetometer utilized Zeeman splitting to measure the scalar intensity of a magnetic field. This magnetometer was converted into a vector instrument for weak fields by the addition of a bias coil. The two fluxgate magnetometers were located on arms so that their sensing directions were identical but 180° out of phase with respect to satellite spin. Checks on the sensitivity of the fluxgate magnetometers were provided by small calibration coils located on each sensor arm and by the rubidium vapor magnetometer.

Reference:

Heppner, J. P., N. F. Ness, C. S. Scearce, and T. L. Skillman, "Explorer 10 Magnetic Field Measurements," *J. Geophys. Res.*, *68*, 1-46, Jan. 1963.

The data available have all been published in the reference and cover the period of 1700 hr on March 25 to 1900 hr on March 27, 1961.

The data include:

1. Plots of trajectory vs universal time
2. Plots of the magnitude and direction of the magnetic field vs universal time

EXPLORER 12 - 1961 UPSILON 1

Apogee	77 300 km	Period	26.5 hr
Perigee	300 km	Inclination	33°

Fluxgate Magnetometer Experiment

Investigator:
L. Cahill-University of New Hampshire

Three orthogonally placed fluxgate magnetometers were mounted at the end of a boom extending 3 ft from the satellite. The spin axis of the payload and one of the sensors (Z sensor) were aligned along the boom. Each sensor had a nominal range of ±1000 gammas in the measurement of the magnetic field component along its sensitive axis. The magnetometer amplifiers were compensated so that the output voltages would be insensitive to variations in temperature and supply voltage. An inflight calibration system applied a known magnetic field to each sensor once every 2 min to provide a check on the sensitivity of each magnetometer. Each sensor was sampled in sequence during a 50-msec interval at a rate of three samples per sec.

Data are available for the period August 16 to December 4, 1961 (with brief gaps). These data consist of plots of the computed values of $|B|$, α, and ψ determined from the directly measured values of the X, Y, and Z sensors. $|B|$ is the magnitude of the magnetic field, $\alpha = \tan^{-1} \sqrt{x^2 + y^2}/Z$, and $\psi = \psi_o + \omega\Delta t + \tan^{-1} y/x$ where ω is spin angular velocity, Δt is time between measurement and "see-sun" time, and ψ_o is the angle between the sun sensor and the X sensor. The data points shown are averages of 32 individually computed values (occasionally 16 values) of $|B|$, α, and ψ.

The data include:

1. $|B|, \alpha, \psi$ vs R_e for inbound and outbound flights
2. $|B|, \alpha, \psi$ vs geomagnetic lat for inbound and outbound flights
3. $|B|, \alpha, \psi$ vs UT for inbound and outbound flights

EXPLORER 18 - 1963 46A

Apogee	196 960 km	Period	93.5 hr
Perigee	192 km	Inclination	33.3°

Magnetic Field Experiment

Investigator:
N. F. Ness–Goddard Space Flight Center

A rubidium 87 vapor magnetometer and two monoaxial fluxgate magnetometers were used to investigate the magnetic fields encountered by Explorer 18. The rubidium vapor magnetometer utilized Zeeman splitting to measure the absolute scalar intensity of a magnetic field. It was combined with a set of triaxial bias coils to provide a vector instrument for the inflight calibration of the two fluxgate magnetometers. Each fluxgate magnetometer consisted of a saturable magnetic core driven by a solenoid. The dynamic range and sensitivity of the fluxgates were $\pm 40\gamma$ ($1\gamma = 10^{-5}$ gauss) and $\pm 1/4\gamma$, respectively. The presence of a magnetic field component along the axis of the element generated a second harmonic signal whose strength was related to the magnitude of the component. The rubidium vapor magnetometer was mounted in a spherical enclosure 1.65 meters from the center of the satellite, while the fluxgate magnetometers were extended on 2.1-meter booms.

Data are available for the period of November 27, 1963, to May 23, 1964, on three magnetic tapes that were written with an IBM 7094 at a density of 556 bpi. The tapes are binary with one countword and 35 data words in a physical record. The data are derived from the fluxgate magnetometers and include:

1. Universal time
2. Averages (5.46-min) of the magnetic field magnitude and direction
3. Geocentric ecliptic, geocentric, and geomagnetic coordinates of the satellite
4. Geomagnetic coordinates of subsolar point
5. Variance of the magnetic field components in both payload (satellite) and geocentric ecliptic coordinate systems

Also available are the hourly averages computed from the first binary tape for November 27, 1963, to February 24, 1964.

A *Data Users' Note* (NSSDC 67-34) covering the reduction techniques and format of available data may be obtained from NSSDC.

EXPLORER 21 - 1964 60A

Apogee	101 940 km	Period	34.9 hr
Perigee	197 km	Inclination	33.5°

Magnetic Field Experiment

Investigators:
N. F. Ness–Goddard Space Flight Center
D. H. Fairfield–Goddard Space Flight Center

Two monoaxial fluxgate magnetometers were used to measure the magnetic fields in interplanetary space, the magnetosheath, and the magnetosphere. The instrumentation and the satellite data telemetry format are

identical to that of Explorer 18 flown one year earlier. The two sensors make nominal angles of 60° and 30°, respectively, with the spacecraft spin axis and have dynamic ranges of approximately ±40γ. Magnetic fields greater than 40γ can be measured, depending on the angles the detector and the field direction make with the spin axis. The telemetered data are digitized to a precision of ±1/4γ.

Data are available on five magnetic tapes for the following periods:

Time Periods	Orbits
October 4 to November 30, 1964	1 - 40
December 18, 1964, to February 8, 1965	53 - 89
March 6 to April 7, 1965	107 - 127

The tapes are 9-track, binary, and written on an IBM 360 at a density of 800 bpi. The tapes can also be provided in a 7-track format.

The data include:

1. Universal time
2. Averages (5.46-min) of the magnetic field magnitude and direction
3. Solar ecliptic field components and variance of solar ecliptic components
4. Radial distance from the earth

ORBITING GEOPHYSICAL OBSERVATORY (OGO 2) - 1965 81A

Apogee	1514 km	Period	104.3 min
Perigee	418 km	Inclination	87.4°

Rubidium Vapor Magnetometer Experiment

Investigators:
J. C. Cain–Goddard Space Flight Center
J. P. Heppner–Goddard Space Flight Center

A crossed pair of double-cell rubidium vapor magnetometers were used to determine the absolute scalar magnitude of magnetic fields. This was achieved by utilizing optical pumping to measure the Zeeman splitting of rubidium 87 energy levels. The magnetometer, located at the end of a boom, had an accuracy of 1 γ (1 γ = 10^{-5} gauss).

The data currently available at NSSDC include 11 binary magnetic tapes written in FORTRAN on an IBM 7094 at a density of 556 bpi and one roll of 35-mm microfilmed plots of the magnetic field vs latitude. Data Set B, on 10 tapes, and Data Set C, on microfilm, cover the period of October 14, 1965, to April 2, 1966. Data Set D includes ephemeris data on one tape and a card deck for calling satellite position for times on the magnetic field data tape. (Data Set A, formerly announced, is not considered usable.)

Data Set B includes:

1. Time
2. Measured magnetic field magnitude

Data Set C includes:

1. Measured magnetic field magnitude
2. Measured magnetic field minus the computed field (using the "GSFC $[12/66]^{-1}$" field model)
3. Latitude, altitude
4. Time

Data Set D includes:

1. Time
2. X, Y, Z (an earth-based geocentric coordinate system in km)

PART II. ATMOSPHERIC PHYSICS AND PLANETARY ATMOSPHERES

A. Ionospheric Ion/Electron Observations

ARIEL 1 - 1962 OMICRON 1

Apogee	1210 km	Period	101 min
Perigee	390 km	Inclination	54°

Electron Density Experiment

Investigator:
J. Sayers–University of Birmingham

Electron density was measured on the Ariel 1 satellite by means of a radio-frequency (RF) plasma probe. To avoid electrical interaction between the satellite and the ionosphere, the probe was mounted on a boom two satellite diameters away from the spacecraft. Direct calculations of electron density were obtained from the measured changes in impedance of the plasma between the grids of the plasma probe after a specified RF voltage was applied.

The data are available for the period of April 26 to July 8, 1962, on one BCD even-parity magnetic tape, which has 11 files at a density of 556 bpi. Each physical record contains from one to 44 logical records.

Data include:

1. Time of observation (UT and local)
2. Geographic position of satellite
3. Geopotential altitude
4. Magnetic shell at point of observation
5. Earth's magnetic field intensity at point of observation
6. Electron density

A *Data Users' Note* (NSSDC 67-23) covering the reduction techniques and format of available data may be obtained from NSSDC.

EXPLORER 17 - 1963 9A

Apogee	914 km	Period	96.4 min
Perigee	254 km	Inclination	58°

Electrostatic Probe Experiment

Investigators:

N. Spencer–Goddard Space Flight Center
L. Brace–Goddard Space Flight Center

Two independent Langmuir probe systems, mounted on the satellite shell, were used to measure the ion concentration and the electron temperature of the ionosphere. Each probe system used a cylindrical shell whose potential was varied with respect to the satellite shell.

The data are listed in two types of tables; one is organized by time and the other by observation station. Data are on one roll of 35-mm film for the periods of April 4 to June 14, and June 25 to July 10, 1963, covering orbits 13 to 1467 (not inclusive). Both tables include:

1. Time of beginning and end observations (local time)
2. Geographic position of satellite
3. Pass start time (UT)
4. Pass number
5. Beginning and end electron temperature observations
6. Beginning and end ion concentration observations
7. Solar index
8. Three-hour magnetic index

A *Data Users' Note* (NSSDC 67-12) covering the reduction techniques and format of available data may be obtained from NSSDC.

TIROS 7 - 1963 24A

Apogee	645 km	Period	97 min
Perigee	620 km	Inclination	58°

Electrostatic Probe Experiment

Investigators:

N. Spencer–Goddard Space Flight Center
L. Brace–Goddard Space Flight Center

A Langmuir probe was used to measure electron density. Data were recorded during orbit and then transmitted upon command. The experiment operated continuously from June 19 to July 14, 1963, at which time there was a failure in the on-board tape unit.

The data are contained on one roll of 35-mm microfilm in a tabular form covering the period of June 19 to July 9, 1963.

Data include:

1. Time of observation
2. Geomagnetic position, dip angle
3. Subsatellite point
4. Electron current, voltage, count

A *Data Users' Note* (NSSDC 67-24) covering the reduction techniques and format of available data may be obtained from NSSDC.

EXPLORER 22 - 1964 64A

Apogee	1077 km	Period	105 min
Perigee	844 km	Inclination	80°

Electrostatic Probe Experiment

Investigator:
L. Brace–Goddard Space Flight Center

A cylindrical electrostatic probe was used on Explorer 22 to perform direct measurements of the electron density (N_e) at the satellite. The experiment was operated every 3 min when the satellite was within range of any of 12 telemetry stations. The two observations occurring nearest any of 10 satellite beacon observing stations were analyzed for N_e and the results tabulated with the corresponding satellite position.

Data are available from October 10, 1964, to May 31, 1965, on one roll of 35-mm microfilm. Observations are still being recorded and additional data are expected to be available this year.

Data include:

1. Beacon station
2. Orbit number
3. Universal time
4. Satellite position
5. Electron density (cm^{-3})

B. Ionospheric Soundings

ALOUETTE 1 - 1962 BETA ALPHA 1

Orbit	1000 km circular		
Period	105 min	Inclination	80°

Swept-Frequency Topside Sounder

The topside sounding instrument in Alouette 1 consists of a pulsed transmitter and a receiver tuned to the transmitter frequency in order to observe the time delay for each frequency of the reflected radio signal. The frequency is varied from 0.5 to 11.5 MHz at a rate of 1 MHz per sec. The satellite moves approximately 80 km during a complete sweep. Since no tape recorder is aboard the satellite, the data observed cover observations when the satellite is within sight of the tracking station. Since the satellite is still making observations, NSSDC will continue to receive Alouette data.

A *Data Users' Note* (NSSDC 67-29) covering the reduction techniques and format of available data may be obtained from NSSDC.

Ionograms

Investigator:

G. L. Nelms–Defence Research Telecommunications Establishment

The Alouette 1 topside ionograms are traces of virtual depth (time delay assuming constant propagation velocity) of reflection vs signal frequency. The ionograms exhibit local phenomena (plasma resonances), echoes from the topside ionosphere from ordinary, extraordinary, and Z propagation modes, and echoes from below the F2 maximum (ground returns and sporadic E layer reflections).

Each ionogram is identified by a time coded on the film. These time codes are related to satellite position by the world maps. From November 1962 to July 1964 two types of world maps are available. One type is the standard abbreviated world map as indicated in Part VI. The other extended type of world map, prepared by ESSA, includes other parameters of interest and lists only scheduled sounding times. For observations subsequent to June 30, 1964, GSFC has prepared similar world maps.

Ionograms are available on 3814 rolls of 35-mm microfilm for the indicated periods from areas within about 1500 km (pass numbers and dates are not necessarily inclusive) from the following telemetry station locations.

Station	Pass No.	Start			End			No. of Rolls
		Mo	Da	Yr	Mo	Da	Yr	
Australia								
Orroral Valley	15713–18447	11	23	65	06	12	66	6
Woomera*	18–15395	09	30	62	10	31	65	94
Canada								
Nfld., St. John's*	11–18563	09	30	62	06	20	66	179
N.W.T., Resolute Bay*†	7–20204	09	29	62	10	18	66	758
Ontario, Ottawa*†	6–20152	09	29	62	10	15	66	359
Sask., Prince Albert*	13– 4473	09	30	62	08	23	63	34
Chile								
Antofagasta†	18– 4130	09	30	62	07	28	63	48
Santiago*†	4246–19936	08	06	63	09	29	66	231
Ecuador, Quito*†	20–18980	09	30	62	07	21	66	233
England, Winkfield*	9–16757	09	29	62	09	23	66	235
Falkland Islands, Pt. Stanley*†	26–20113	10	01	62	10	12	66	291
Malaysia, Singapore†	12–24360	09	30	62	07	16	63	229
Nigeria, Kano	9625–11735	09	03	64	02	05	65	8
Norway, Tromso	19334–19428	08	16	66	08	22	66	2
S. Africa, Johannesburg	15548–16335	11	11	65	01	08	66	1
U.S.A.								
Alaska, College*†	1–19349	09	29	62	08	17	66	624
Alaska, Fairbanks	15793–20041	11	29	65	10	06	66	70
Colorado, Boulder	16571–18330	01	25	66	06	03	66	9
Florida, Ft. Myers*†	12–18199	09	30	62	05	24	66	73
Hawaii, Kauai*	14274–18559	08	10	65	07	20	66	3
Hawaii, South Point*†	531–13451	11	07	62	06	10	65	26
Maryland, Blossom Point†	6– 6527	09	29	62	01	20	64	78
Minnesota, E. Grand Forks*	1940–18566	02	18	63	06	20	66	223

***Alosyn data available; see Alosyn description.**
†ESSA N(e) vs True Height data available; see description.

Alosyn

Investigators:

E. L. Hagg–Defence Research Telecommunications Establishment
G. E. K. Lockwood–Defence Research Telecommunications Establishment

Alosyn are Alouette 1 topside sounder synoptic data which consist of tabulations of selected ionospheric parameters read from the ionograms. The parameters are listed in the chronological order in which the ionograms were recorded, one tabulation row for each ionogram.

These data are available in hard copy or on magnetic tape. Hard copy is tabulated on approximately 4300 pages (8 books), covering the period September 29, 1962, to April 30, 1964. The tape format covers the period of September 29, 1962, to February 1, 1964, and is on two reels of magnetic tape (556 bpi). Data are listed as follows for locations near stations designated * on the previous table of ionograms.

1. Time of observation (universal and local solar)
2. Latitude, longitude, and height of the satellite
3. Solar zenith angle and magnetic dip angle at the satellite
4. Gyrofrequency and plasma frequency at the satellite
5. Observed extraordinary wave frequency and its accuracy
6. Quality of the reflection trace at the satellite
7. Observed ordinary and extraordinary wave penetration
8. Maximum radio frequency of observed sporadic E
9. Strength of signal returned from the earth (strong, weak, no echoes)
10. Three-hourly magnetic K_p index

ESSA N_e vs True Height

Investigators:

R. Norton–Institute for Telecommunication Sciences and Aeronomy
W. Calvert–Institute for Telecommunication Sciences and Aeronomy
T. E. Van Zandt–Institute for Telecommunication Sciences and Aeronomy

These tabulations present electron density and frequency vs true height from selected Alouette 1 ionograms. Data are available from a variety of Alouette telemetry stations from November 1962 through June 1965. The ionograms used for these data were recorded by the stations indicated by a † in the ionogram station list.

DRTE N_e vs True Height

Investigators:

G. L. B. Nelms–Defence Research Telecommunications Establishment
G. E. K. Lockwood–Defence Research Telecommunications Establishment

The data available cover the period of September 29, 1962, to March 30, 1966, and contain electron density profiles that were derived by the method of laminations from selected Alouette 1 ionograms. Frequency vs lamina heights are available on four reels of magnetic tape that were written at a density of 556 bpi. The Data Center can convert these data to electron density vs any specified true heights for individual requests.

The data include:

1. Time of observation
2. Latitude, longitude, and zenith angle

3. Magnetic dip angle and gyrofrequency at the satellite
4. Table of electron density (or frequency) vs real height for each reduced ionogram
5. Total electron content

RSRS N_e vs True Height

Investigator:
J. W. King-Radio and Space Research Station

These tabulations present ionospheric electron density vs true height and electron density vs geopotential height, derived from selected groups of Alouette ionograms. Data are available for selected times in 1962 and 1963 in three volumes for locations near Singapore and the Falkland Islands.

Station/Pass No.	Date			Begin Time (UT)	No. of Soundings
	Mo	Da	Yr		
Pt. Stanley, Falkland Is.					
1626	01	26	63	1012	29
1660	01	28	63	2221	31
1667	01	29	63	1017	23
1836	02	10	63	1953	29
Singapore, Malaysia					
792	11	26	62	0707	30
1952	02	19	63	0811	32
2292	03	16	63	0609	30
2346	03	20	63	0508	28
2414	03	25	63	0443	30
2706	05	16	63	1323	20
2801	04	22	63	1228	29
4164	07	31	63	1034	28

Data include:

1. Date and UT of observation
2. Latitude and longitude of the satellite
3. Electron density vs true height
4. Electron density vs geopotential height

ARC N_e and Plasma Scale Height vs True Height

Investigators:
L. Colin–Ames Research Center
K-L. Chan–Ames Research Center

Investigators: (continued)
J. O. Thomas*–Ames Research Center
M. J. Rycroft**–Ames Research Center

These data consist of tabulations of electron density vs true height and plasma scale height vs true height. The electron densities were derived from selected Alouette 1 ionograms by the method of overlapping polynomials. The data are available for observations taken within approximately 1500 km of the telemetry stations listed.

Quantity	Ground Stations	Time Periods Covered						
		Mo	Da	Yr		Mo	Da	Yr
600 sheets	Stanford University	05	01	63	-	07	23	63
1500 sheets	North and South America	11	01	62	-	01	29	63
		03	01	63	-	03	31	63
		05	03	63	-	07	31	63
		09	01	63	-	09	30	63
		10	31	63	-	10	31	63
200 sheets	Hawaii	11	07	62	-	12	09	62
		05	08	63	-	06	06	63
		10	16	63	-	11	30	63

Each tabulation includes:

1. Date, universal time, local solar time, and pass number
2. Latitude and longitude of the satellite
3. Electron density vs true height (each 50 km)
4. Plasma scale height vs true height (each 50 km)

EXPLORER 20 - 1964 51A

Apogee	1020 km	Period	103.9 min
Perigee	869 km	Inclination	79.9°

Fixed-Frequency Topside Sounder

Investigators:
R. Knecht–Institute for Telecommunication Sciences and Aeronomy
W. Calvert–Institute for Telecommunication Sciences and Aeronomy
T. E. Van Zandt–Institute for Telecommunication Sciences and Aeronomy

The fixed-frequency topside sounder was a pulsed radio sounder that operated on the following six frequencies: 1.50, 2.00, 2.85, 3.72, 5.47, and 7.22 MHz. The six frequencies, pulsed in sequence, were cycled through in 0.105 sec. The satellite moved less than 1 km between successive soundings of the same frequencies and recorded the time of transit for all reflected signals it received.

*Now at University of London.
**Now at University of Southampton.

The data currently available at NSSDC consist of 907 rolls of ionograms on 35-mm microfilm that cover the period of August 25, 1964, to May 5, 1965. Each frame has the day, the universal time, and the trace of the virtual depth vs the frequency. The corresponding latitudes and longitudes can be found from the world maps.

ALOUETTE 2 - 1965 98A

Apogee	2887 km	Period	121 min
Perigee	505 km	Inclination	80°

Ionograms

Investigator:
E. S. Warren–Defence Research Telecommunications Establishment

The topside sounder instrumentation is a miniaturized version of a conventional ground-based sounder or ionosonde. It consists of a pulsed transmitter and a receiver tuned to the transmitter frequency. The sounder sweeps the frequencies between 0.2 MHz and 13.5 MHz. The sweep rate is 0.15 MHz per sec (between 0.2 and 2.0 MHz) and 1.0 MHz per sec (between 2.0 and 13.5 MHz).

The Alouette 2 topside ionograms exhibit local phenomena (plasma resonances), echoes from the topside ionosphere from ordinary, extraordinary, and Z propagation modes, and echoes from below the F2 maximum atmospheric layer (ground returns and sporadic E layer reflections).

Ionograms are received at NSSDC on a continuing basis. Ionograms are currently available on 449 rolls of 35-mm microfilm for the indicated periods from the stations listed in the following table. (Pass numbers and dates are not necessarily inclusive.)

Station	Pass No.	Start			End			No. of Rolls
		Mo	Da	Yr	Mo	Da	Yr	
Australia, Orroral Valley	27–3146	12	01	65	08	21	66	32
Canada								
Nfld., St. John's	16–3206	11	30	65	08	26	66	2
N.W.T., Resolute Bay	12–3757	12	04	65	10	12	66	58
Ontario, Ottawa	5–4870	11	29	65	01	13	67	105
Chile, Santiago	4–2582	11	29	65	07	05	66	26
Ecuador, Quito	4–2735	11	29	65	07	17	66	36
Falkland Islands, Pt. Stanley	74–2776	12	05	65	07	21	66	27
Malaysia, Singapore	241–3904	12	19	65	10	24	66	42
Nigeria, Kano	14–3104	11	30	65	08	18	66	24
S. Africa, Johannesburg	125–2808	12	09	65	07	24	66	36
U.S.A.								
Alaska, College	1–2734	11	29	65	07	17	67	34
Alaska, Fairbanks	7–3116	11	29	65	08	19	66	12
Florida, Ft. Myers	28–3337	12	01	65	09	06	66	8
Hawaii, Kauai	42–2620	02	12	65	07	08	66	5
Minnesota, E. Grand Forks	18–2059	11	30	65	05	21	66	2

C. Radiometry

EXPLORER 7 - 1959 IOTA 1

Apogee	1090 km	Period	101 min
Perigee	555 km	Inclination	50°

Thermal Radiation Experiment

Investigator:
V. Suomi–University of Wisconsin

Simple bolometers in the form of hemispheres were mounted on, but thermally isolated from, plane mirrors. The five mirror-backed hemispheres were mounted on the equator of the spin-stabilized satellite. Two of the hemispheres, coated black, responded about equally to solar and terrestrial radiation; a third, coated white, was more sensitive to terrestrial than to solar radiation; and a fourth, gold plated, was more sensitive to solar than to terrestrial radiation. The fifth, a tabor-surfaced hemisphere equipped with a sunshade, was used to measure reflected sunlight when the satellite axis pointed towards the earth's surface. A black sphere, mounted on the axis of the satellite at the top, was used to determine any deterioration in the mirror surfaces by comparison with the black hemispheres. Temperatures from all the satellite instruments were measured by glass-coated bead thermistors.

Temperatures and derived radiation data from the white sensor are available for nighttime passes on one 200-bpi BCD magnetic tape for the periods of November 15 to December 2, 1959; January 3 to April 10, 1960; and April 16 to May 24, 1960. Each physical record has 80 characters and is either a header record or a data record which includes:

1. Time of observation and station
2. Satellite latitude and longitude
3. Long-wave radiation
4. Solid angle to the earth
5. White sensor temperature
6. Reference temperatures

Temperatures from all the sensors are available on two binary magnetic tapes for the periods of December 6, 1959, to April 16, 1960; April 16 to May 27, 1960; and June 3 to 4, 1960.

The binary tapes were written at a density of 200 bpi by a CDC-1604 so that each physical record contains 274 36-bit words and one final word of 24 bits.

Data include:

1. Time of observation
2. Station
3. Sensor and mirror temperatures
4. Reference temperatures

A *Data Users' Note* (NSSDC 67-17) covering the reduction techniques and format of available data may be obtained from NSSDC.

TIROS 2 - 1960 PI 1

Apogee	730 km	Period	98 min
Perigee	620 km	Inclination	48°

Scanning Radiometer Data

Source: Planetary Radiations Branch, Goddard Space Flight Center

The TIROS 2 meteorological satellite contained a five-channel medium-resolution scanning radiometer. Two of the channels of this instrument were sensitive to reflected solar radiation, and the remaining three responded to emitted terrestrial radiation. The spectral ranges of the detector were as follows:

Channel	Nominal Bandwidth (microns)
1	5.72 - 7.0
2	7.2 -22.2
3	0.26 - 7.6
4	7.2 -32.6
5	0.365- 3.35

Infrared data, along with orbital, attitude, and calibration data, were incorporated in a computer program for an IBM 7090 which was used to produce a "Final Meteorological Radiation Tape" (binary). Copies of this tape or printout from it are available through the Data Center for the period of November 23, 1960, to April 13, 1961.

These data are presently being maintained by the Goddard Laboratory for Atmospheric and Biological Sciences. The Data Center will service individual requests for the data as promptly as possible. Unusual delays, however, may result from the additional processing required before transferring the tapes to NSSDC for distribution.

The National Space Science Data Center has the TIROS 2 *Radiation Data Catalog* (Vol. 1) and the *Radiation Data Users' Manual* and *Supplement* available for distribution.

TIROS 3 - 1961 RHO 1

Apogee	810 km	Period	100 min
Perigee	740 km	Inclination	48°

Scanning Radiometer Data

Source: Planetary Radiations Branch, Goddard Space Flight Center

The TIROS 3 meteorological satellite contained a five-channel medium-resolution scanning radiometer. Two of the channels of this instrument were sensitive to reflected solar radiation, and the remaining three responded to emitted radiation from the earth and its atmosphere. The three thermal channels were calibrated in terms of equivalent black-body temperatures, and the visible channels were calibrated in terms of effective radiant emittances. The spectral ranges of the detector were as follows:

Channel	Nominal Bandwidth (microns)
1	5.7 - 7.0
2	7.07 -25.00
3	0.25 - 6.82
4	7.4 -32.6
5	0.475- 2.900

Radiation data were incorporated with calibration data and orbital and attitude data onto an IBM 7090 "Final Meteorological Radiation Tape" (binary). A copy of this tape or printout from the tape is available through the Data Center for the period of July 12 to December 30, 1961.

These data are presently being maintained by the Goddard Laboratory for Atmospheric and Biological Sciences. The Data Center will service individual requests for the data as promptly as possible. Unusual delays, however, may result from the additional processing required before transferring the tapes to NSSDC for distribution.

The National Space Science Data Center has the TIROS 3 *Radiation Data Catalog* and the *Radiation Data Users' Manual* and *Supplement* available for distribution.

Thermal Radiation Experiment

Investigator:
V. Suomi-University of Wisconsin

The instrumentation for the thermal radiation experiment on TIROS 3 consisted of two sets of detectors, each set containing a black and an anodized aluminum (white) sensor. The two sets were mounted opposite each other on booms extended from the lower part of the satellite body.

Each sensor consisted of a hemisphere and a mirror which prevented the hemisphere from "seeing" the spacecraft. The sensor temperatures were measured by thermistors, which were fastened with epoxy cement to the inside of the hemispheric shells. The information telemetered to earth included temperatures of the mirrors and sensors and the value of a fixed resistor, which enabled compensation for drift in the electronics system.

Data are available for the period of July 12 to October 20, 1961, on five BCD magnetic tapes with a density of 556 bpi. Each record is 117 characters in length.

Data include:

1. Time
2. Latitude, longitude, height
3. Attitude information
4. Reference resistor value
5. White sensor temperature
6. Black sensor temperature (high and low)
7. Mirror temperatures

TIROS 4 - 1962 BETA 1

Apogee	840 km	Period	100 min
Perigee	710 km	Inclination	48°

Scanning Radiometer Data

Source: Planetary Radiations Branch, Goddard Space Flight Center

The TIROS 4 meteorological satellite contained a medium-resolution scanning radiometer. Two of the channels of this instrument were sensitive to reflected solar radiation, and the remaining two responded to emitted thermal radiation from the earth and its atmosphere. The two thermal channels were calibrated in terms of equivalent black-body temperatures, and the reflected solar radiation channels were calibrated in terms of effective radiant emittances. The effective spectral responses of each channel are shown below.

Channel	Nominal Bandwidth (microns)
1	6.0 - 6.5
2	8.0 -12.0
3	0.2 - 6.0
4	Time Reference Channel
5	0.55- 0.75

The calibration data, along with orbital and attitude data, and the radiation data from the satellite were incorporated in a computer program for an IBM 7090 which was used to produce, in binary form, the "Final Meteorological Radiation Tape," which is the basic repository for all radiation data. Copies of this tape or printout from it are available at the Data Center for the period of February 8 to June 30, 1962.

These data are presently being maintained by the Goddard Laboratory for Atmospheric and Biological Sciences. The Data Center will service individual requests for the data as promptly as possible. Unusual delays, however, may result from the additional processing required before transferring the tapes to NSSDC for distribution.

The National Space Science Data Center has the TIROS 4 *Radiation Data Catalog and Users' Manual* available for distribution.

Thermal Radiation Experiment

Investigator:
V. Suomi–University of Wisconsin

The instrumentation for the thermal radiation experiment on TIROS 4 consisted of two sets of detectors, each set containing a black and an anodized aluminum (white) sensor. The two sets were mounted opposite each other on booms extended from the lower part of the satellite body.

Each sensor consisted of a hemisphere and a mirror which prevented the hemisphere from "seeing" the spacecraft. The sensor temperatures were measured by thermistors, which were fastened with epoxy cement to the inside of the hemispheric shells. The information telemetered to earth included temperatures of the mirrors and sensors and the value of a fixed resistor, which enabled compensation for drift in the electronics system.

These data are available for the period of February 8 to June 28, 1962, on 10 BCD magnetic tapes with a density of 556 bpi. Each record is 120 characters in length.

Data include:

1. Time
2. Latitude, longitude, height

3. Solar elevation angle
4. Reference resistor value
5. White sensor temperature (high)
6. Black sensor temperature (high and low)
7. Mirror temperatures

Radiance value data are also available on two magnetic tapes with a density of 556 bpi. The data include:

1. Orbit
2. Subsatellite point (latitude and longitude)
3. Albedo
4. Zenith angle of the sun
5. Data quality indicators

MARINER 2 - 1962 ALPHA RHO 1

Infrared Radiometer Experiment

Investigators:

S. C. Chase–Jet Propulsion Laboratory
L. D. Kaplan–Jet Propulsion Laboratory
G. Neugebauer–Jet Propulsion Laboratory

Measurements of the 8.4-μ and the 10.4-μ radiation temperature of small regions of Venus were made using an infrared radiometer on Mariner 2. The 10.4-μ rotation-vibration band of CO_2 was selected to measure the absorption due to CO_2, while the 8.4-μ measurement covered a region where the gaseous absorption was expected to be negligible.

Data are available for three scans of Venus from 1859 to 1934 UT on December 14, 1962.

Reference: Chase, S. C., L. D. Kaplan, G. Neugebauer, "The Mariner 2 Infrared Radiometer Experiment," *J. Geophys. Res., 68,* No. 22, 6157–6169, Nov. 15, 1963.

All of the data have been published in the referenced article and are available on 12 sheets from NSSDC.

Data include:

1. Universal time
2. Latitude, longitude
3. Energy
4. Temperature

Venus Microwave Radiometer Experiment

Investigators:

A. H. Barrett–Massachusetts Institute of Technology
J. Copeland–Ewen Knight Corporation
D. E. Jones–Jet Propulsion Laboratory
A. E. Lilley–Harvard Observatory

A satellite-borne radio telescope observed microwave emissions from the planet Venus at 13.5 mm (22.2 GHz) and 19 mm (15.8 GHz) on December 14, 1962. The experiment was designed to establish the origin of the radio emission at cm and mm wavelengths and to observe its variations. Radio emissions were observed every 20.16 sec from 1344 to 2037 UT. Three scans made between 1902 and 1937 UT encountered the planetary disk. The first and third scan swept the dark and illuminated limbs of Venus, respectively; whereas the second scan crossed the terminator at a small angle.

The investigators have published six temperature calculations from the peak values for each scan at both wavelengths. Since the inflight and preflight calibration values of observing equipment were different from that planned, considerable difficulty was encountered in computing planetary temperatures. Specifically, the actual sensor time constants and instrument calibration values were significantly different from prelaunch values. Also, the determination of time of planetary encounter is somewhat subjective since it was estimated from the radiometric observations.

The radiometer data are tabulated on 20 pages and include the following information (items 3, 4, and 5 in units of 47 millivolts):

1. Spacecraft time
2. Frame count
3. Antenna position potentiometer output (Radiometer scan - RSC)
4. Channel 1 (19 mm) digital voltage output (Radiometer 1 R-1)
5. Channel 2 (13.5 mm) digital voltage output (Radiometer 2 R-2)

TIROS 7 - 1963 24A

Apogee	645 km	Period	97 min
Perigee	620 km	Inclination	58°

Scanning Radiometer Data

Source: Planetary Radiations Branch, Goddard Space Flight Center

The TIROS 7 meteorological satellite contained a medium-resolution scanning radiometer. Two of the channels of the instrument were sensitive to reflected solar radiation, and the other three responded to emitted thermal radiation from the earth and its atmosphere. Channel 1 of TIROS 7 was sensitive within the 15-μ carbon dioxide region and replaced the 6.0- to 6.5-μ water vapor channel of TIROS 2, 3, and 4. The three thermal channels were calibrated in terms of equivalent black-body temperatures, and the reflected solar radiation channels were calibrated in terms of effective radiant emittances. The channel bandwidths are shown below.

Channel	Nominal Bandwidth (microns)
1	14.8 -15.5
2	8.0 -12.0
3	0.2 - 6.0
4	8.0 -30.0
5	0.55- 0.75

The calibration data, along with orbital and attitude data, and the radiation data from the satellite were incorporated in a computer program for an IBM 7094 which was used to produce, in binary form, the "Final Meteorological Radiation Tape," which is the basic repository of all radiation data. These data cover the period of June 19, 1963, to June 19, 1965.

These data are presently being maintained by the Goddard Laboratory for Atmospheric and Biological Sciences. The Data Center will service individual requests for the data as promptly as possible. Unusual delays, however, may result from the additional processing required before transferring the tapes to NSSDC for distribution.

The National Space Science Data Center has the TIROS 7 *Radiation Data Catalog and Users' Manual* available for distribution. Catalogs and manuals are applicable for the following periods:

Volume 1 - June 19 to September 30, 1963
Volume 2 - October 1, 1963, to February 29, 1964
Volume 3 - March 1 to September 30, 1964
Volume 4 - October 1, 1964, to June 19, 1965

Thermal Radiation Experiment

Investigator:
V. Suomi-University of Wisconsin

The instrumentation for the thermal radiation experiment on TIROS 7 consisted of two sets of detectors, each set containing a black and an anodized aluminum (white) sensor. The two sets were mounted opposite each other on booms extended from the lower part of the satellite body.

Each sensor consisted of a hemisphere and a mirror which prevented the hemisphere from "seeing" the spacecraft. The sensor temperatures were measured by thermistors, which were fastened with epoxy cement to the inside of the hemispheric shells. The information telemetered to earth included temperatures of the mirrors and sensors and the value of a fixed resistor, which enabled compensation for drift in the electronics system.

Data are available for the period of June 19 to August 29, 1963, on nine BCD magnetic tapes with a density of 556 bpi. Each record is 117 characters in length.

Data include:

1. Time
2. Latitude, longitude, height
3. Attitude information
4. Reference resistor value
5. White sensor temperature
6. Black sensor temperature (high and low)
7. Mirror temperatures

NIMBUS 1 - 1964 52A

Apogee	930 km	Period	98 min
Perigee	420 km	Inclination	98.6°

High-Resolution Infrared Radiometer Data

Source: Nimbus Project Office, Goddard Space Flight Center

The Nimbus 1 meteorological satellite contained a high-resolution infrared radiometer (HRIR) designed to map nighttime cloud cover and surface temperatures emitted within the 3.5- to 4.1-micron atmospheric window.

HRIR data were acquired during the period of August 28 to September 22, 1964, after which a spacecraft malfunction occurred.

These data are available on binary magnetic tapes with a density of 800 bpi and on 70-mm photofacsimile film format copies, which include:

1. Positive transparencies
2. Negative transparencies
3. Positive prints, including enlargements

The magnetic tape data are presently being maintained by the Goddard Laboratory for Atmospheric and Biological Sciences. The Data Center will service individual requests for the data as promptly as possible. Unusual delays, however, may result from the additional processing required before transferring the tapes to NSSDC for distribution.

The National Space Science Data Center has *Nimbus 1 High-Resolution Radiation Data Catalogs* and *Users' Manuals (Vol. 1-2)* available for distribution.

NIMBUS 2 - 1966 40A

Apogee	1179 km	Period	108 min
Perigee	1095 km	Inclination	100°

High-Resolution Infrared Radiometer Data

Source: Nimbus Project Office, Goddard Space Flight Center

The Nimbus 2 meteorological satellite contained a high-resolution infrared radiometer (HRIR) designed to map nighttime cloud cover and surface temperatures emitted within the 3.5- to 4.1-micron atmospheric window. HRIR data are available for the period of May 15 to September 30, 1966.

These data are available on binary magnetic tapes with a density of 800 bpi and on 70-mm photofacsimile film format copies, which include:

1. Positive transparencies
2. Negative transparencies
3. Positive prints, including enlargements

The magnetic tape data are presently being maintained by the Goddard Laboratory for Atmospheric and Biological Sciences. The Data Center will service individual requests for the data as promptly as possible. Unusual delays, however, may result from the additional processing required before transferring the tapes to NSSDC for distribution.

The National Space Science Data Center has the *Nimbus 2 Data Catalogs* (Vol. 1-5), the *Nimbus 2 HRIR Montage Catalog*, the *Nimbus 2 AVCS Montage Catalog*, and the *Nimbus 2 Users' Guide* available for distribution.

Medium-Resolution Infrared Radiometer Data

Source: Nimbus Project Office, Goddard Space Flight Center

The Nimbus 2 meteorological satellite contained a five-channel medium-resolution scanning radiometer. Data were obtained for heat balance of the earth-atmosphere system, water vapor distribution, surface or near-surface temperatures, and seasonal changes of stratospheric temperature distribution studies. The spectral ranges of the detector were as follows:

Channel	Nominal Bandwidth (microns)
1	6.4- 6.9
2	10 -11
3	14 -16
4	5.0-30.0
5	0.2- 4.0

The data for the period of May 15 to July 29, 1966, are available as:

1. Digital magnetic (binary) tapes
2. Positive or negative transparencies (4- x 5-in.)
3. Positive prints, including enlargements

The National Space Science Data Center has the *Nimbus 2 Data Catalogs* (Vol. 1–5) and the *Nimbus 2 Users' Guide* available for distribution.

D. General Observations

EXPLORER 17 - 1963 9A

Apogee	914 km	Period	96.4 min
Perigee	254 km	Inclination	58°

Mass Spectrometer Experiment

Investigator:
C. Reber–Goddard Space Flight Center

Two double-focusing magnetic mass spectrometers were placed on the spin axis of the Explorer 17 satellite to measure the local concentrations of neutral particles with energies of 0.4 to 12 ev. One of the mass spectrometers gave useful values of density for atmospheric helium, molecular nitrogen, and atomic oxygen for 187 real-time interrogation passes. The spectrometer consisted of an external ionizing source, which had been designed to reduce interaction between the sampled particles and the sensor, an electrostatic ion lens, a magnetic analyzer, and collector electrodes. The collector electrodes were placed in appropriate spectrographic positions to monitor the ion beams of particular masses. The current from each of these electrodes was sampled sequentially by a sensitive electrometer and logarithmic amplifier for telemetric purposes. Since the spacecraft had no data storage capability, observations were obtained only when within receiving distance of ground read-out stations. The summation of data from all the ground stations allowed diurnal/altitude variations to be observed, even though this injected a geographic variation as well.

Reference: Reber, C. A., and M. Nicolet, "Investigation of the Major Constituents of the April–May 1963 Heterosphere by the Explorer XVII Satellite," *Planetary and Space Science, 13,* 617–646, July 1965.

Results of the experiment have been published in the referenced article in printed tabular form and are available on seven sheets from NSSDC.

Data are available for the periods:

April 3 to 22, 1963
May 20 to June 1, 1963

Data include:

1. Time of observation (local)
2. Pass number
3. Geographic position of satellite
4. Observing station
5. Angle between the spin axis and velocity vector
6. Magnetic index, A_p
7. Solar index
8. Number density, helium
9. Number density, nitrogen
10. Number density, oxygen

A *Data Users' Note* (NSSDC 67-09) covering the reduction techniques and format of available data may be obtained from NSSDC.

FR-1A - 1965 101A

Apogee	762 km	Period	100 min
Perigee	746 km	Inclination	78°

VLF Experiment

Investigator:
L. R. O. Storey–Centre National d'Etudes des Telecommunications

The spacecraft, designed by Centre National d'Etudes des Spatiales, was launched from the Western Test Range by a Scout rocket. The FR-1A VLF experiment was designed to study the propagation of VLF waves in the ionosphere and to investigate irregularities in the electron distribution of the ionosphere. The satellite used five VLF receivers, three loop antennas, and two dipole antennas to receive the VLF signals that were transmitted from ground stations at 16.8 and 24 kHz.

The quick-look data for the period of December 6, 1965, to May 2, 1966, are currently available from NSSDC. The data are presented as plots of magnetic field parameters superimposed over maps of the satellite orbits. Reproductions from 35-mm microfilm of approximately 216 plots can be made as negative transparencies or positive paper prints. The plots include:

1. Orbit number and date
2. Universal and local time
3. Transmitting station and transmitter
4. Satellite receiver and mode of operation
5. Root mean square of the VLF magnetic field strength
6. Eccentricity of the ellipse described by the magnetic field vector

PART III. INTERPLANETARY DUST PARTICLES, LUNAR, AND PLANETARY STUDIES

A. Micrometeorites and Cosmic Dust

EXPLORER 1 - 1958 ALPHA 1

Apogee	2550 km	Period	115 min
Perigee	358 km	Inclination	33°

Micrometeorite Detector Microphone Experiment

Investigators:

M. Dubin*–Air Force Cambridge Research Laboratories
E. Manring–Air Force Cambridge Research Laboratories

Direct measurements of micrometeorites were made with a sensing device consisting of a piezoelectric crystal transducer with a transistorized amplifier for the detection of the impulse vibrations transmitted along the sensitive exposed surface. The instrument had a threshold momentum of 2.5×10^{-3} gm/cm/sec and a sensitive area of 0.23 m^2. The impact rate was 8.0×10^{-3} m^{-2} sec^{-1} for cosmic particles of mass greater than 8×10^{-10} gm based upon the calibration and an impact velocity of 30 km/sec. The experiment lasted from February 1 to 11, 1958.

Reference: Dubin, M., "IGY Micrometeorite Measurements," *Space Research,* Proceedings of the First International Space Science Symposium, Nice, 1042–1058, 1960.

The data tables, found on pages 1047-1052 of the referenced article, include 178 data points (no. of hits) corrected to 145 data points. All the results of the experiment are recorded in the tables and are also available on three sheets from NSSDC.

Data include:

1. Station
2. Date
3. Universal time
4. Duration of station pass
5. Number of hits
6. Total number of station passes
7. Total time per station

*Now with NASA Headquarters, Washington, D.C.

PIONEER 1 - 1958 ETA 1

No orbit achieved.
Maximum height: 113 137 km

Micrometeorite Detector Microphone Experiment

Investigator:
M. Dubin*-Air Force Cambridge Research Laboratories

The micrometeorite detector on board Pioneer 1 was similar to the one flown on Explorer 1. The detector consisted of a sounding board connected to a piezoelectric crystal transducer with a transistorized amplifier. The instrument had a threshold momentum of 1.5×10^{-4} gm/cm/sec and a sensitive area of 0.038 m^2. The impact rate was calculated at 4.0×10^{-3} m^{-2} sec^{-1} for particles of mass greater than 10^{-10} gm based on an impact velocity of 30 km/sec. The experiment lasted from 1.2×10^3 to 164.25×10^3 sec after launch.

Reference: Dubin, M., "IGY Micrometeorite Measurements," *Space Research,* Proceedings of the First International Space Science Symposium, Nice, 1042-1058, 1960.

All of the results of the experiment have been published on pages 1053 and 1054 in the referenced article and are also available on two sheets from NSSDC.

Data include:

1. Time after launch (sec x 10^3)
2. Impact location given in geocentric distance (R_e)

EXPLORER 13 - 1961 CHI

Apogee	793 km	Period	97 min
Perigee	175 km	Inclination	38°

Micrometeorite Impact Detection Experiment

Investigator:
A. G. Beswick-Langley Research Center

The impact detectors flown on Explorer 13 consisted of two sounding boards sensitized by piezoelectric crystals and 20 pressure cells instrumented with a transducer. The sounding boards had electronically selected sensitivity levels of 1.00 dyne sec and 0.01 dyne sec with a sensitive area of 1.53 ft^2. The design sensitivity of the pressure cells was 0.10 dyne sec with a sensitive area of 2.30 ft^2. Data were collected from August 25 to 27, 1961.

Reference: D'Aiutolo, Charles T., "The Micrometeoroid Satellite Explorer XIII (1961 Chi)," NASA TN D-2468, Nov. 1964.

The data included in the referenced article on page 198 are arranged in tabular form and are also available from NSSDC on one printed sheet.

*Now with NASA Headquarters, Washington, D.C.

Data include:

1. Orbit number
2. Station
3. Date and universal time
4. Elapsed time from injection (min)
5. Counting rate for three sensitivity levels

EXPLORER 16 - 1962 BETA CHI

Apogee	1173 km	Period	104 min
Perigee	746 km	Inclination	52°

Micrometeoroid Experiments

Explorer 16, also designated the S-55B micrometeoroid satellite, was part of a micrometeoroid program directed by NASA's Office of Advanced Research and Technology. The satellite was placed in orbit on December 16, 1962, and continued to return experimental data until July 22, 1963. The objectives of the five micrometeoroid experiments on board were to obtain information regarding puncture hazards to thin metals, as well as to gather information on micrometeoroid impacts having energies insufficient to puncture the metals. The following entries are descriptions of the data sets from Explorer 16 available at NSSDC.

Reference: Hastings, E. C., Jr., "The Explorer XVI Micrometeoroid Satellite," NASA TM-X-810, Feb. 1963. (Also see Supplements I-III, TM-X-824, Apr. 1963, TM-X-899, Sept. 1963, and TM-X-949, Mar. 1964.)

Pressurized Cell Experiment (Explorer 16 - Data Set 1)

Investigators:
C. A. Gurtler–Langley Research Center
W. H. Kincaid–Langley Research Center

The primary thin-metal puncture experiment consisted of 160 annealed beryllium-copper cells filled with helium. Of this total, 100 cells had a 0.001-in. skin thickness and a total area of 10.625 sq ft, 40 had a 0.002-in. skin thickness and a total area of 4.250 sq ft, and 20 had a 0.005-in. skin thickness with an area of 2.125 sq ft. When a cell was punctured, the gas leaked out and the pressure loss activated a switch signaling the cell rupture.

All the data for the total time period are available in tabular form from NSSDC on eight sheets. The data are also available in the following reports (identified in the previous reference):

TM-X-810, page 9	TM-X-899, pages 5-9
TM-X-824, page 3	TM-X-949, pages 5-6

Data include:

1. Pass number
2. Date (UT)
3. Interrogation time (UT)
4. Accumulated punctures for 0.001-in., 0.002-in. and 0.005-in. skin thickness cells

Cadmium-Sulfide Cell and Copper-Wire Card Detectors (Explorer 16 - Data Set 2)

Investigator:
L. Secretan-Goddard Space Flight Center

Two selected cadmium-sulfide cells were used to measure the area of perforation due to impacts of dust particles through a 1/4-mil aluminized mylar film. Each cell had an effective area of 2×10^{-3} m^2. The mylar film of Cell A was left completely opaque; Cell B was perforated with a nominal 0.002-in. hole for inflight calibration purposes. The calibration established a linear relationship between resistance and temperature. Cumulative status readouts of the perforated areas were made when the satellite was in a suitable position both as to orbit and solar aspect. These data were then compensated to a temperature of 35°C for tabulation purposes. Cell A measurements range over a 25-day period from December 16, 1962, through January 9, 1963; measurements for Cell B cover the 20-day period from December 16, 1962, through January 4, 1963.

As a companion detector, 46 copper-wire cards, each consisting of a continuous winding of 0.002- or 0.003-in. copper wire closely wound on a melamine card, were used as one of the metal penetration experiments. Thirty-two 0.003-in. wire cards were connected in series of twos to form 16 sensors; the other fourteen 0.002-in. sensors functioned individually. The total area of the 0.002-in. sensors was 0.664 sq ft, and the area of the 0.003-in. sensors was 1.517 sq ft. A puncture in a wire caused a change in circuit resistance. Once a puncture or break occurred in a wire, additional data could not be obtained from the card. The wire grids were monitored for the lifetime of the satellite. Two breaks occurred, one in the 3-mil wire on June 28, 1963, and one in the 2-mil wire on July 13, 1963.

Reference: Secretan, L., "Measurements of Interplanetary Dust Particle Flux from Explorer XVI CdS and Wire Grid Dust Particle Detectors," Proceedings of a Symposium on Meteor Orbits and Dust, Smithsonian Contributions to Astrophysics, Cambridge, Mass., Aug. 9-13, 1965.

The cadmium-sulfide cell data appear in the above reference on pages 310-312 and are also available from NSSDC in a tabular format which includes:

1. Date (month, day)
2. Cumulative time (days)
3. Hole area (mm^2)

Steel-Covered Grid Detectors (Explorer 16 - Data Set 3)

Investigator:
E. H. Davidson-Lewis Research Center

The steel-covered grid detectors were part of the thin-metal puncture hazard experiments. The sensors were made of type 304 stainless-steel segments mounted on the outside surface of a thin continuous grid circuit. A puncture of the stainless-steel cover broke the circuit beneath it; this was indicated by a change in resistance. The thicknesses and total areas of the detectors were as follows:

No. of Detectors	Thickness	Total Area
2	0.001 in.	1.5 ft^2
3	0.003 in.	2.0 ft^2
1	0.006 in.	0.25 ft^2

Reference: Davidson, E. H., and P. C. Winslow, Jr., "Micrometeoroid Satellite (Explorer XVI) Stainless-Steel Penetration Rate Experiment," NASA TN D-2445, Aug. 1964.

All the data from this experiment are available on page 6 of the reference and on one sheet from NSSDC. Data were collected for the time period December 16, 1962, to May 29, 1963.

Data include:

1. Date (year, month, day)
2. Accumulated number of punctures
3. Total exposed area remaining

Micrometeoroid Impact Detection System (Explorer 16 - Data Set 4)

Investigator:
A. G. Beswick–Langley Research Center

The impact detection system experiment consisted of two stainless-steel sounding boards sensitized by piezoelectric crystals. The sounding boards, located on the nose cone of the satellite, had three electronically selected sensitivity levels. Two sensitivity levels were 1 dyne sec and 0.1 dyne sec for an exposed area of 1.53 sq ft. A third sensitivity level was provided by 20 beryllium-copper pressure cells, each with a 0.005-in. skin thickness, instrumented with transducers to act as impact detectors. Their design sensitivity was 0.5 dyne sec for a total exposed area of 2.0 sq ft.

All the data for the period December 16, 1962, to April 19, 1963, are available on three graph sheets from NSSDC. Data are also available in NASA TM-X-949, pages 25–27.

Data include:

1. Time after launch (10-day periods)
2. Date (year, month, day)
3. Count rate (number/sec)

PEGASUS 1, 2, AND 3 - PEGASUS METEOROID PROJECT

Meteoroid Penetration Detectors

Investigator:
R. J. Naumann–Marshall Space Flight Center

	Pegasus 1 1965 9A	Pegasus 2 1965 39A	Pegasus 3 1965 60A
Launch Date	February 16, 1965	May 25, 1965	July 30, 1965
Apogee	738 km	742 km	540 km
Perigee	502 km	512 km	522 km
Period	97 min	97.2 min	95.3 min
Inclination	31.8°	31.7°	28.9°

The primary mission of the Pegasus Project is to obtain data on the flux of meteoroids in near-earth space. Meteoroids detected were those capable of penetrating three selected thicknesses of aluminum panels which acted as capacitor detectors. The selected thicknesses were 0.4 mm, 0.2 mm, and 0.038 mm. A layer of vapor-deposited copper was placed between two 12-micron mylar layers acting as a dielectric. The capacitors were maintained at constant voltage; detection of discharge and subsequent recharge, accomplished electronically, signified a meteoroid penetration. An array of 208 panels was positioned on a collapsed wing structure which deployed after launch to 96 ft long and 14 ft wide. Thus, a meteoroid detection area of over 2000 sq ft was provided as a penetration surface. NSSDC has penetration data on the number of valid hits for the time period February 17, 1965, through June 24, 1967. Data are still being collected from the three spacecraft and will be sent to NSSDC on a quarterly basis.

The data are currently available on one tape in even-parity with 80 BCD characters per record at a density of 556 bpi. The data are also available on approximately 4000 punched cards or 68 data tabulation sheets of computer printout.

Data include:

1. Year, day, hour, and minute of penetration (UT)
2. Location of wing section and side penetrated
3. Number of the panel group penetrated
4. Thickness penetrated (16 mil, 8 mil, or 1.5 mil)
5. Pulse verification (duration in msec)
6. Temperatures (°C) of both sides of the wing section at time of penetration
7. Satellite clock time at penetration
8. Ecliptic latitude and longitude when penetrated
9. Geocentric latitude and longitude when penetrated
10. Right ascension and declination when penetrated
11. Local time when penetrated (longitude time zone)

B. Lunar Photographs

RANGERS 7, 8, AND 9

Lunar Television Data

	Location of Impact (Selenographic)	Altitude of First Picture (km)	Altitude of Last Picture (km)
Ranger 7 1964 41A	20.6°W, 10.6°S	2110	0.44
Ranger 8 1965 10A	24.8°E, 2.6°N	2510	0.16
Ranger 9 1965 23A	2.4°W, 12.9°S	2378	0.60

Source: Jet Propulsion Laboratory

The Ranger 7, 8, and 9 spacecraft took thousands of TV photographs during the few minutes preceding lunar impact. Each spacecraft carried six television cameras that transmitted over two separate channels designated F and P (for full scan and partial scan). The F-channel contained cameras A and B, while the four P-channel cameras were designated P_1 through P_4. One-inch-diameter vidicons were used for image sensing in all six cameras on each

probe. The lenses had a resolution of 50 line pairs/mm; resolution of the camera systems was approximately 36 line pairs/mm. The characteristics of the six cameras which were common to each of the Rangers are listed below:

Characteristic	A	B	P_1	P_2	P_3	P_4
Focal length, mm	25	76	76	76	25	25
f number	1.0	2.0	2.0	2.0	1.0	1.0
Frame time, sec	2.56	2.56	0.2	0.2	0.2	0.2
Horizontal frequency, cps	450	450	1500	1500	1500	1500
Exposure time, msec	5	5	2	2	2	2
Field of view, deg	25	8.4	2.1	2.1	6.3	6.3
Target size, mm	11	11	2.8	2.8	2.8	2.8
Scan lines	1150	1150	300	300	300	300
Time between frames, sec	5.12	5.12	0.84	0.84	0.84	0.84

The dynamic ranges were 200-700 ft-L for cameras A, P_3, P_4 on all three Rangers, 80-2600 ft-L for cameras B, P_1, P_2 on Ranger 7, and 80-1500 ft-L for cameras B, P_1, P_2 on Rangers 8 and 9.

All of the Ranger photographs are available in the form of enlarged paper prints for selected frames or 35-mm film negatives or positives along with the associated photographic parameters needed for analysis of the pictures. In addition, a representative collection of Ranger 7, 8, and 9 photographs are available in the following publications at a cost of $6.50 per volume.

1. "Ranger VII Photographs of the Moon, Part I: Camera 'A' Series," NASA SP-61, Sept. 1964.

2. "Ranger VII Photographs of the Moon, Part II: Camera 'B' Series," NASA SP-62, Feb. 1965.

3. "Ranger VII Photographs of the Moon, Part III: Camera 'P' Series," NASA SP-63, Aug. 1965.

4. "Ranger VIII Photographs of the Moon, Cameras 'A', 'B' and 'P'," NASA SP-111, 1966.

5. "Ranger IX Photographs of the Moon, Cameras 'A', 'B' and 'P', " NASA SP-112, 1966.

Copies of these publications are available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402.

SURVEYORS 1, 3, 5, 6, AND 7

Lunar Television Data

Source: Surveyor Project Office - Jet Propulsion Laboratory

Spacecraft	Landing Coordinates (Selenographic)	Timespan of Data	No. of Photos
Surveyor 1 - 1966 45A	02.53°S - 43.32°W	June 2-14, 1966 - July 12-13, 1966	11 000
Surveyor 3 - 1967 35A	02.94°S - 23.34°W	April 20 - May 3, 1967	6 300
Surveyor 5 - 1967 84A	01.41°N - 23.18°E	Sept. 11-24, 1967 - Oct. 15-23, 1967	18 000
Surveyor 6 - 1967 112A	00.46°N - 01.37°W	Oct. 10-24, 1967	30 000
Surveyor 7 - 1968 01A	40.89°S - 11.44°W	Jan. 10-23, 1968 - Feb. 13-14, 1968	21 000

The television subsystem was designed to obtain lunar surface photographs at the millimeter scale. The slow-scan survey television camera provided images of the lunar surface over a 360° panorama. Each picture was imaged through an optical system onto a vidicon image sensor whose electron beam scanned a photo-conductive surface to produce an electrical output that was telemetered back to earth receiving stations.

The normal exposure time was 150 msec, which was extendable on command. Focal length of the optics could be adjusted to 25 or 100 mm, covering a field 6.4° square at maximum focal length and 25.3° square at the wide-angle setting. Panoramas of the landing site taken in the narrow-angle mode contained about 10 times as many pictures as those taken in the wide-angle mode.

To satisfy user requests for these photographs, reproductions from 70-mm film will be made. The reproductions can be processed as 70-mm positive or negative film transparencies or as positive paper prints, including enlargements.

Ancillary data available to the user consist of tabular listings of television identification data, 8- x 10-in. prints of computer processed frames, and mosaics prepared from the individual frames. Animated film sequences from Surveyor 3 are available showing lunar sunset and the surface sampling operation.

A *Data Users' Note* (NSSDC 67-30) for Surveyor 1 photographs covering the reduction techniques and format of available data may be obtained from NSSDC. In addition, the NSSDC has published a *Catalog of Surveyor 1 Television Pictures* (NSSDC 68-10) that is available for distribution. The *Catalog* will serve as a reference for selecting and ordering photographs of primary interest. At some future date catalogs of Surveyor 3, 5, 6, and 7 television pictures will be published by the NSSDC. Persons requesting these catalogs will be put on the mailing list, and copies will be distributed as they become available.

LUNAR ORBITERS 1, 2, 3, 4, AND 5

Spacecraft	Periods of Photographic Coverage
Lunar Orbiter 1 - 1966 73A	August 18 to 29, 1966
Lunar Orbiter 2 - 1966 100A	November 18 to 25, 1966
Lunar Orbiter 3 - 1967 8A	February 15 to 23, 1967
Lunar Orbiter 4 - 1967 41A	May 11 to 26, 1967
Lunar Orbiter 5 - 1967 75A	August 8 to 18, 1967

	Missions 1, 2, and 3	Mission 4	Mission 5
Orbit Period	3.5 hr	12 hr	Initial - 8.4 hr Intermediate - 8.3 hr Final - 3.2 hr
Orbit Inclination	12 and 21°	85°	85°
Perilune Altitude	60 km	2700 km	Initial - 200 km Intermediate - 100 km Final - 100 km
Apolune Altitude	1850 km	6100 km	Initial - 6000 km Intermediate - 6000 km Final - 1500 km
Sunlight Time	75%	100%	100%

Lunar Terrain Photographs

Source: Lunar Orbiter Project Office-Langley Research Center

Approximately 750 high-resolution and 1010 medium-resolution photographs of the lunar surface were taken by Lunar Orbiters 1, 2, 3, 4, and 5. The photographic subsystem was essentially the same on all five missions. The subsystem was designed to take photographs simultaneously at high- and medium-resolutions from a predetermined altitude above the lunar surface. Two separate lens, shutter, and platen systems utilizing the same film supply were provided. The high-resolution lens (telephoto) had a 24-in. focal length and a focal-plane shutter. The medium-resolution lens was a wide-angle lens having a focal length of 80 mm and a between-lens shutter. Both lens had an aperture of f/5.6. Each system was provided with image motion compensation by means of translation of the film plane. This compensation was controlled by a velocity/height (V/H) sensor. The subsystem utilized 70-mm film which was provided with pre-exposed edge data consisting of gray scales, resolution charts, identification number, and linearity patches. Exposure time of the photography was set at 1/25, 1/50, or 1/100 sec. Automatic sequences of 1, 4, 8, or 16 photos could be obtained.

The photographs taken on Lunar Orbiters 1, 2, and 3 show three major types of terrain found along the lunar equator: maria (or seas), highland areas, and craters. Also included are photographs of the east limb, portions of the lunar farside, and two earth-moon photographs.

The prime objectives of Lunar Orbiter 4 were to perform a broad, systematic photographic survey of lunar surface features to increase the scientific knowledge of their nature, origin, and processes, and to serve as a basis for selecting sites for more detailed scientific study. It was necessary for the spacecraft to orbit the moon at a relatively high altitude and in a near-polar orbit, whereas on previous missions the altitude and inclinations were considerably lower. The photos of Lunar Orbiter 4 cover 99% of the nearside and 60% of the farside of the moon.

Lunar Orbiter 5 was primarily a multi-site scientific mission that included photography of some previously unphotographed farside areas and additional photography of candidate Apollo landing sites.

Mercator index maps prepared by the Aeronautical Chart and Information Center, USAF, will be provided to persons interested in obtaining photographs. The index maps show the locations of all the sites photographed with respect to the lunar surface and should be useful in selecting frames of primary interest. NSSDC is also in the process of microfilming on 35-mm roll film all Lunar Orbiter photography. These will provide requesters another means of selecting lunar photos.

C. Planetology

GEMINIS 3 THROUGH 12

Satellite	Launch Date	Launch Time (UT)	Mission Duration (hr)	Period (min)	Apogee (km)	Perigee (km)	Inclination
Gemini 3 -1965-24A	03/25/65	1424	4.9	88.2	224	160	32.5°
Gemini 4 -1965-43A	06/03/65	1515	97.9	89.0	280	160	32.0°
Gemini 5 -1965-68A	08/21/65	1400	190.9	89.5	344	160	32.6°
Gemini 7 -1965-100A	12/04/65	1400	330.6	89.2	326	160	28.9°
Gemini 6 -1965-104A	12/15/65	1337	25.9	88.5	259	160	28.9°

Satellite	Launch Date	Launch Time (UT)	Mission Duration (hr)	Period (min)	Apogee (km)	Perigee (km)	Inclination
Gemini 8 -1966-20A	03/16/66	1641	10.7	88.8	270	160	28.9°
Gemini 9 -1966-47A	06/03/66	1340	72.3	88.8	270	160	28.9°
Gemini 10-1966-66A	07/18/66	2220	70.8	88.8	269	160	28.9°
Gemini 11-1966-81A	09/12/66	1442	71.3	89.0	278	160	28.8°
Gemini 12-1966-104A	11/11/66	2047	94.5	89.0	280	160	28.9°

Synoptic Earth Terrain Photographs

Investigator:
P. D. Lowman, Jr.–Goddard Space Flight Center

More than 2500 synoptic terrain photographs of earth taken by astronauts aboard Geminis 3 through 12 are available for analysis. The photographs show major geologic structures, their form, color, and albedo. Some photographs are also useful for geographic and oceanographic investigations. An inventory list of available photos will be provided upon request.

Reproductions of these photographs can be made in color as 2-1/4" x 2-1/4" mounted positive transparencies. Photographs are also available in black and white in the form of 70-mm positive film transparencies or positive paper prints, including enlargements.

The film format used for all Gemini photographs is 55 mm^2 on 70-mm width film. The camera(s), lens(es), and types of film(s) used during each mission are identified in the following table:

Spacecraft	Camera	Lens(es)	Film Type(s)
Gemini 3	Hasselblad, Model 500C (NASA Modified)	Zeiss Planar, 80-mm F.L.; f:2.8	Eastman Kodak Ektachrome, MS (S.O. 217)
Gemini 4	Hasselblad, Model 500C (NASA Modified)	Zeiss Planar, 80-mm F.L.; f:2.8	Eastman Kodak Ektachrome, MS (S.O. 217)
Gemini 5	Hasselblad, Model 500C (NASA Modified)	Zeiss Planar, 80-mm F.L.; f:2.8	Eastman Kodak Ektachrome, MS (S.O. 217) General Analine and Film, Anscochrome D-50
Gemini 6	Hasselblad, Model 500C (NASA Modified)	Zeiss Planar, 80-mm F.L.; f:2.8	Eastman Kodak Ektachrome, MS (S.O. 217)
Gemini 7	Hasselblad, Model 500C (NASA Modified)	Zeiss Planar, 80-mm F.L.; f:2.8 Zeiss Sonnar, 250-mm F.L.; f:4.5	Eastman Kodak Ektachrome, MS (S.O. 217) Eastman Kodak Ektachrome, Infrared Type-8443 Eastman Kodak Panatomic-X, Type 3400 Eastman Kodak Type-2475

Spacecraft	Camera	Lens(es)	Film Type(s)
Gemini 8	Hasselblad, Model 500C (NASA Modified)	Zeiss Planar, 80-mm F.L.; f:2.8	Eastman Kodak Ektachrome, MS (S.O. 217)
Gemini 9	Hasselblad, Model 500C (NASA Modified) Hasselblad, Super Wide Angle-C (NASA Modified) J. A. Maurer 70-mm Space Camera	Zeiss Planar, 80-mm F.L.; f:2.8 Zeiss Biogon, 38-mm F.L.; f:4.5 Xenotar, 80-mm F.L.; f:2.8	Eastman Kodak Ektachrome, MS (S.O. 217)
Gemini 10	J. A. Maurer 70-mm Space Camera Hasselblad, Super Wide Angle	Xenotar, 80-mm F.L.; f:2.8 Zeiss Biogon, 38-mm F.L.; f:4.5	Eastman Kodak Ektachrome, MS (S.O. 217)
Gemini 11	J. A. Maurer 70-mm Space Camera Hasselblad, Super Wide Angle	Xenotar, 80-mm F.L.; f:2.8 Zeiss Biogon, 38-mm F.L.; f:4.5	Eastman Kodak Ektachrome, MS (S.O. 368)
Gemini 12	J. A. Maurer 70-mm Space Camera Hasselblad, Super Wide Angle	Xenotar, 80-mm F.L.; f:2.8 Zeiss Biogon, 38-mm F.L.; f:4.5	Eastman Kodak Ektachrome, MS (S.O. 368)

A special volume containing 244 selected Gemini color photographs, *Earth Photographs from Gemini 3, 4, and 5,* NASA SP-129, Office of Technology Utilization, Washington, D.C., 1967, is for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, at a price of $7.00.

Requests for photographic reproductions should be directed to NSSDC. Requests for publication should be directed to the U.S. Government Printing Office.

PART IV. SOLAR PHYSICS AND ASTROPHYSICS

A. Ultraviolet and Visible Measurements

GREB 1 - 1960 ETA 2

Apogee	1057 km	Period	101.5 min
Perigee	615 km	Inclination	67.5°

Solar X-Ray (2-8 A) and Lyman-Alpha Experiment

Investigators:

R. W. Kreplin–Naval Research Laboratory
T. A. Chubb–Naval Research Laboratory
H. Friedman–Naval Research Laboratory

(See Greb 1 in Part IV, Section B, for data description.)

ORBITING SOLAR OBSERVATORY (OSO 1) - 1962 ZETA 1

Apogee	595 km	Period	96 min
Perigee	550 km	Inclination	33°

Lyman-Alpha Experiment (1100-1250 A)

Investigator:

K. Hallam–Goddard Space Flight Center

A carbon-disulfide-filled ion chamber with a lithium fluoride window was used to monitor the solar Lyman-alpha (1100 to 1250 A) radiation. The ion chamber was calibrated in the laboratory by comparison with a standard ionization chamber using a monochrometer source. Radiation damage to the lithium fluoride window decreased the sensitivity of the ion chamber about 20% per week after the first 230 orbits.

The reduced data, on nine rolls of 35-mm microfilm, are printout tables for each orbit for which data are present. Useful data cover the period of March 7 to May 15, 1962. The tables list the peak flux reading (in volts) and the corresponding time of measurements in universal time. Each table is identified by orbit number, orbit start time, and the spin axis attitude averaged over the orbit.

The data include:

1. Time of observation (UT)
2. Orbit start time (UT)
3. Orbit number (80° west longitude crossing)
4. Spin axis orientation (averaged over the orbit)
5. Peak flux reading (in volts)

Solar Flux Monitor Experiment (3800-4800 A)

Investigator:
K. Hallam–Goddard Space Flight Center

Solar ultraviolet radiation flux was measured by a filtered high-current photodiode. There were two filters which restricted the spectral response of the instrument to 3800–4800 A. The exposed filter was an evaporated platinum film of a 2-mm thick fused silica substrate. The inner filter was made of Scott-Jens blue glass. The output of the photodiode went to an amplifier which had been biased to amplify the flux peaks in an energy range approximately 20% above the ultraviolet energy received at ground level.

Tabulated data from the photometer are available at NSSDC on two rolls of 35-mm microfilm. Although the data indicated a rapid decrease in sensitivity of the photodiode, useful data cover the period from March 15 to 28, 1962, or orbits 125 through 318 inclusive. The tables give the peak energy in microamperes and the universal time for each measurement. Orbit start time and attitude, averaged over the orbit, are given for each table.

Data include:

1. Time of observation (UT)
2. Orbit start time (UT)
3. Orbit number (80° west longitude crossing)
4. Spin axis orientation (averaged over the orbit)
5. Peak flux reading (in microamperes)

EXPLORER 30 - 1965 93A

Apogee	900 km	Period	101 min
Perigee	692 km	Inclination	60°

X-Ray and Ultraviolet Monitoring Experiment

Investigators:
R. W. Kreplin–Naval Research Laboratory
H. Friedman–Naval Research Laboratory
T. A. Chubb–Naval Research Laboratory

(See Explorer 30 in Part IV, Section B, for data description.)

B. X-Ray Measurements

GREB 1 - 1960 ETA 2

Apogee	1057 km	Period	101.5 min
Perigee	615 km	Inclination	67.5°

Solar X-Ray (2-8 A) and Lyman-Alpha Experiment

Investigators:

R. W. Kreplin–Naval Research Laboratory
T. A. Chubb–Naval Research Laboratory
H. Friedman–Naval Research Laboratory

Solar radiation was investigated by an ultraviolet and an X-ray photometer and a vacuum photocell that was used as a visible light aspect system. The two photometers were ion chambers that had the following characteristics:

	Ultraviolet	X-Ray
Spectral Sensitivity	1050–1350 A	2-8 A
Window Material	Lithium Fluoride	Beryllium
Window Thickness	~1 mm	0.005 in.
Absorbing Gas	Nitric Oxide at 15 mm	Argon at 760 mm

The three detectors were mounted along the equator of the satellite. The aspect photocell and the ultraviolet detector had the same direction of view, while the X-ray detector looked in the opposite direction. The X-ray detector was mounted behind a magnet, which served to deflect most of the Van Allen belt electrons. Fluxes were derived by fitting gray-body spectra to the observed ion chamber currents.

Reference: Kreplin, R. W., T. A. Chubb, and H. Friedman, "X-Ray and Lyman-Alpha Emission from the Sun as Measured from the NRL SR-1 Satellite," *J. Geophys. Res., 67,* 2231–2253, June 1962.

The results, which have been published in the reference in tabular form for the period July 1 to November 15, 1960, include the following X-ray and Lyman-alpha data:

X-Ray:

1. Universal time and aspect angle
2. X-ray fluxes
3. Flares and other solar and ionospheric events

Lyman-Alpha:

Lyman-alpha flux (daily averages)

GREB 3 - 1961 OMICRON 2

Apogee	1020 km	Period	104 min
Perigee	860 km	Inclination	67°

Solar X-Ray Measurements (8-20 A)

Investigator:
R. W. Kreplin–Naval Research Laboratory

The Greb 3 (Solar Radiation 3, SR 3) satellite never separated from the Injun satellite. The X-ray detectors on the Greb 3 satellite were gas-filled ionization chambers with responses in the 8- to 20-A region. Because the two satellites did not separate, tumbling and a slow roll-rate resulted. This made the data reduction difficult.

The data from 69 random observations have been reduced under the assumption that the shape of the X-ray spectrum can be described by the Planck function with a temperature of 2×10^6 deg K.

Reference: Acton, L. W., T. A. Chubb, R. W. Kreplin, and J. F. Meekins, "Observation of Solar X-Ray Emission in the 8- to 20-A Band," *J. Geophys. Res., 68,* 3335–3344, June 1, 1963.

X-ray flux data are presented in tabular form on two sheets for the period of June 29 to December 14, 1961, and have been published in the reference.

Data include:

1. Time of observation (UT)
2. X-ray flux (wavelengths <20 A)

INJUN 1 - 1961 OMICRON 2

Apogee	1020 km	Period	104 min
Perigee	860 km	Inclination	67°

Solar X-Ray Measurements (0-14 A)

Investigators:
L. A. Frank–State University of Iowa*
J. A. Van Allen–State University of Iowa*

The Injun 1 satellite was launched along with Transit 4A and Greb 3; however, Injun 1 and Greb 3 did not separate from each other. The Injun 1 carried a thin-windowed Geiger tube (Anton type 213, 1.2 mg/cm^2 mica), which measured X rays in the 0- to 14-A range. The conical field of view of the instrument scanned the sky in a more or less random manner, but was occasionally directed toward the sun for brief periods of time.

The data from 36 random observations are presented in tabular form on four printed sheets as count rate sec^{-1} (wavelength <20 A) vs UT for the period of June 29 to August 22, 1961, and are published in:

Maehlum, B., L. A. Frank, and J. A. Van Allen, "Solar X-Ray Observations by Injun 1," SUI 64-27, State University of Iowa, July 1964.

Data include:

1. Time of observation (UT)
2. Count rate sec^{-1}

*Now called University of Iowa.

ORBITING SOLAR OBSERVATORY (OSO 1) - 1962 ZETA 1

Apogee	595 km	Period	96 min
Perigee	550 km	Inclination	33°

Spectrometer Experiment (10-400 A)

Investigators:

W. Neupert–Goddard Space Flight Center
W. Behring–Goddard Space Flight Center

The OSO 1 solar spectrometer was used to measure solar euv radiation in the range of 10-400 A. Direct solar radiation was dispersed by a concave grating into its component wavelengths which were focused along the Rowland Circle. The detector was mounted on a carriage which moved along the Rowland Circle. This mechanical motion resulted in one complete scan through the 10- to 400-A spectrum every 8 min whenever the instrument was in sunlight. Counting rate recorded as amplitude has been plotted versus time on a semilogarithmic scale for all available data.

A combination of lower sensitivity and scattered radiation makes it extremely difficult to interpret the spectrum below 170 A. In addition, at wavelengths above 342 A the second order images of intense spectral lines obscure that portion of the data. Although the 170- to 400-A data have been microfilmed, the usable range of the data can be considered to be from 170 to 340 A. The data covering the range 50 to 400 A can be used with special precautions. The data between 50 and 170 A will be made available for inspection by request to the Data Center.

Data are available on 12 rolls of 35-mm microfilm for most of the sunlit portion of OSO 1 (March 7 to May 15, 1962).

Data include for each scan:

1. Time of observation (UT)
2. Orbit number
3. Counting rate vs the distance from the pole of the grating to the exit slit

A *Data Users' Note* (NSSDC 67-03) covering the reduction techniques and format of available data may be obtained from NSSDC.

Solar X-Ray Experiment (1-8 A)

Investigator:

W. A. White–Goddard Space Flight Center

A xenon-filled ion chamber with a thin beryllium window was used to detect solar X-ray flux integrated over the interval 0.1-10 A. The data were calibrated, averaged, and plotted in terms of percent of full scale (flux) vs UT and spacecraft position. Each plot covers approximately one revolution (~96 min). The instrument was on only during the sunlit portions of the orbit (~56 min).

Useful data were received for 1039 orbits until both on-board tape recorders failed. These data cover the period of March 7 to May 15, 1962, and are available on one roll of 35-mm film.

Data include:

1. Time of observation (UT)
2. Satellite latitude
3. Satellite longitude
4. X-ray flux (percent of full scale)

A *Data Users' Note* (NSSDC 67-06) covering the reduction techniques and format of available data may be obtained from NSSDC.

Solar X-Ray Experiment (20-100 kev)

Investigator:
K. Frost–Goddard Space Flight Center

A scintillation counter consisting of a cylindrical NaI crystal and a photomultiplier tube was carried in the solar-oriented section of OSO 1 to detect solar X-ray flux in the 20- to 100-kev energy interval. The instrument was on during the sunlit portions of the orbits only.

The data were calibrated, averaged, and both tabulated and plotted in terms of counts/sec vs universal time and spacecraft position. Each plot, continuous during the sunlit portion of the orbit, covers approximately one revolution (~96 min). Each plot is identified by date, orbit number (at the end of the plot), and the title "S-16 Chan-4 X-ray Monitor." Most of the plots covering the period of March 7 to May 15, 1962 (1037 orbits), by which time both tape recorders had failed, are available from NSSDC. The data are available on three 35-mm microfilm rolls and include:

1. Time of observation (UT)
2. Satellite latitude
3. Satellite longitude
4. Scintillometer values, individual and average (counts/sec)

A *Data Users' Note* (NSSDC 67-07) covering the reduction techniques and format of available data may be obtained from NSSDC.

VELA - 1963 39A

Apogee	113 000 km	Period	105 hr
Perigee	102 000 km	Inclination	38°

Solar X-Ray Measurements (0.5-10 A)

Investigator:
J. P. Conner–Los Alamos Scientific Laboratory

The VELA satellite carried a scintillation counter with two filters to detect X rays in the 0.5- to 10-A region. The scintillator was a cesium iodide crystal of 5 mg/cm^2. Beryllium filters, 7 mg/cm^2 and 117 mg/cm^2 thick, transmitted to 0.5- to 10-A and 0.5- to 4-A bands, respectively. The energy flux range was from 10^{-3} ergs cm^{-2} sec^{-1} (threshold) to 5×10^{-2} ergs cm^{-2} sec^{-1} (saturation).

The data are presented as plots of the energy flux dissipated in the scintillation crystal as a function of time. In order to convert to incident flux it would be necessary to assume the spectral distribution of incident radiation, which is not known. Reasonable assumptions of what the spectral distribution might be would give incident flux values for the more important events larger than the values plotted by a factor of 2 to 10, depending upon the hardness of radiation in the individual events.

Graphs on four printed pages are available at NSSDC for the period of October 17 to 31, 1963. During this period, many X-ray events caused by high solar activity were recorded.

Data include:

1. Time of observation (UT)
2. X-ray flux

GREB 5 - 1964 01D

Apogee	930 km	Period	103 min
Perigee	905 km	Inclination	70°

X-Ray Flux Measurements

Investigators:
R. W. Kreplin–Naval Research Laboratory
H. Friedman–Naval Research Laboratory
T. A. Chubb–Naval Research Laboratory

Five gas-filled ionization chambers were used as photometers to measure the solar X-ray flux; a similar detector was used to measure ultraviolet flux. The five X-ray photometers had the following characteristics:

Detector	Window Material	Window Thickness	Gas
2- 8 A	Beryllium	0.005 in.	Argon
8-14 A	Aluminum	0.0005 in.	Nitrogen
8-16 A	Aluminum	0.00035 in.	Nitrogen
44-55 A	Mylar	0.00025 in.	Nitrogen
44-60 A	Mylar	0.00025 in.	Nitrogen

Magnetic brooms were used in each detector to lessen the sensitivity of the X-ray photometers to the trapped particle radiation of the Van Allen belt. The aspect angle was determined by a sun-earth pulse-amplitude aspect system and a solar pulse-width aspect system.

The data are available on two magnetic tapes that are card images at a density of 556 bpi. The fluxes were derived by fitting gray-body spectra to the observed currents. The data include:

1. Machine-reduced data, three points per pass, for January 12 to August 31, 1964:
   a. Time, station, and aspect angle
   b. Fluxes for 8-12 A and 44-60 A
2. Hand-reduced data, one point per pass, for January 11, 1964, to February 3, 1965:
   a. Time, station, and aspect angle
   b. Currents and fluxes for all detectors (The 8- to 16-A and 44- to 55-A detectors failed after 1 month, while the ultraviolet detector lasted 2 days.)

The tabulated daily averages and the constituent times of observations for the period of January 11 to October 30, 1964, are available in printed form for the fluxes in the 0- to 8-A, 8- to 12-A, and 44- to 60-A ranges.

ORBITING SOLAR OBSERVATORY (OSO 2) - 1965 7A

Apogee	633 km	Period	96.5 min
Perigee	551 km	Inclination	32.9°

Solar X-Ray Measurements

Investigators:
T. A. Chubb–Naval Research Laboratory
H. Friedman–Naval Research Laboratory
R. W. Kreplin–Naval Research Laboratory

Five Geiger-Mueller counters were used to measure the flux of solar X rays. A different detector was used for each of the three bands: 2-8 A, 8-20 A, and 44-60 A. These three counters operated only when they were pointed directly at the sun. A fourth detector, also sensitive in the 2- to 8-A range, was oriented away from the sun to indicate the background radiation. The fifth Geiger counter, equipped with a disk to artificially eclipse the sun, served as a prominence detector. The measured currents were converted to fluxes by fitting the data to gray-body spectra.

The data available consist of computer plots and listings on two rolls of 35-mm microfilm. The time period covered is February 4 to March 8, 1965, and the data include:

1. Graphs of minute averages of solar X-ray flux vs universal time for each counter
2. Tabulations of counting rate, flux, and standard deviations vs universal time for each graph

EXPLORER 30 - 1965 93A

Apogee	900 km	Period	101 min
Perigee	692 km	Inclination	60°

X-Ray and Ultraviolet Monitoring Experiment

Investigators:
R. W. Kreplin–Naval Research Laboratory
H. Friedman–Naval Research Laboratory
T. A. Chubb–Naval Research Laboratory

Explorer 30 contained a group of 10 X-ray and two ultraviolet detectors that measured solar radiation in the wavelength regions given in the following table:

Wavelengths	Detectors
0.5-3 A	Two Geiger counters
1-8 A	Two Geiger counters, two ion chambers
8-16 A	Two ion chambers
1-20 A	One ion chamber

Wavelengths	Detectors
44-60 A	One ion chamber
1080-1350 A (including Lyman-alpha line)	One ion chamber
1225-1350 A (excluding Lyman-alpha line)	One ion chamber

Minute by minute averages of X-ray flux (or UV detector current) for each detector are available on 18 magnetic tapes. These tapes are BCD card images recorded at 556 bpi. The data are arranged on the tapes according to orbit number. Within a given orbit the data for each station are listed, and these data are arranged chronologically for each detector.

Data from November 27, 1965, through August 24, 1967, are available from the Data Center. The data include:

1. Time of observation
2. Orbit number
3. Station
4. X-ray detector flux (or UV detector current)

C. Gamma Rays

EXPLORER 11 - 1961 NU 1

Apogee	1786 km	Period	108.1 min
Perigee	486 km	Inclination	28.9°

Gamma-Ray Telescope Experiment

Investigators:
W. L. Kraushaar*–Massachusetts Institute of Technology
G. W. Clark–Massachusetts Institute of Technology

The gamma-ray telescope, designed to search for high-energy gamma rays (>50 Mev), consisted of one anticoincidence plastic scintillation counter roughly 1500 cm^2 in area, a sandwich crystal scintillator 7.6 cm in diameter and 3 cm thick, and a cylindrical lucite Cerenkov detector about 7.6 cm in diameter and 7.6 cm thick.

The arrival of a gamma ray was signaled by a coincidence between the sandwich scintillation counter and the Cerenkov counter, provided that no pulse was received from the large cone-shaped anticoincidence or veto plastic scintillation counter.

Of the total of about 7 months that the instrument was turned on and working in orbit, only 141 hr, or 3%, have been culled as useful observing time. During these 141 hr, 1012 events were accepted as gamma rays by the circuit logic. For each detected event several pertinent quantities were computed. In addition, for purposes of further analysis such as evaluating apparent gamma-ray intensities from different parts of the sky, random events were generated at such a rate that their total number is about 25 times the total number of real events.

*Now at University of Wisconsin.

The data available consist of one digital tape of real events and one digital tape of random events for the period of April 27 to November 17, 1961. These binary tapes were prepared by an IBM 7094 with FORTRAN and written at a density of 556 bpi, with 23 logical records of 11 data words in each physical record.

Data include:

1. Time of observation (Julian time)
2. Geographic position of satellite
3. Geomagnetic position
4. Satellite orientation in celestial and galactic coordinates
5. Additional positional and orientation information

A *Data Users' Note* (NSSDC 67-25) covering the reduction techniques and format of available data may be obtained from NSSDC.

ORBITING SOLAR OBSERVATORY (OSO 1) - 1962 ZETA 1

Apogee	595 km	Period	96 min
Perigee	550 km	Inclination	33°

High-Energy Gamma-Ray Experiment

Investigators:
G. G. Fazio*–University of Rochester
E. M. Hafner–University of Rochester

The high-energy gamma-ray detector was placed on OSO 1 to search for gamma radiation (>50 Mev) from the sun and other celestial sources. The detector consisted of a Cerenkov counter and two scintillation counters separated by a 1/16-in. lead sheet, which converted photons to electron-positron pairs.

Approximately 16 000 sheets of computer printout are available on 35-mm microfilm for most orbits between orbit number 150 (March 17, 1962) and number 1782 (July 3, 1962).

Data include:

1. Time of observation (UT)
2. Orbit number
3. Spin-axis orientation
4. Sky data (counts)
5. Earth data (counts)

Gamma-Ray Experiment (50 kev - 3 Mev)

Investigator:
L. E. Peterson**–University of Minnesota

*Now at Smithsonian Astrophysical Observatory.
**Now at University of California/San Diego.

The University of Minnesota gamma-ray experiment on the OSO 1 was designed to detect cosmic and solar gamma rays in the energy range of 50 kev to 3 Mev. The instrument, located in the rotating wheel member of the OSO, consisted of the following three detectors:

1. A 2.54-cm-diameter x 1.27-cm-long NaI scintillation counter with a 0.5-cm-thick lead collimating shield operating over the 50- to 150-kev range

2. A 5.1-cm-diameter x 5.75-cm-long NaI plastic phoswich counter with isotropic response operating in two channels over the 0.3- to 1.0-Mev and 1.0 to 3.0-Mev range

3. A Compton telescope consisting of a 3.2- x 3.2-cm NaI scintillation counter in coincidence with the phoswich counter

Each wheel scan was divided into sixteen 22.5° sectors by a set of sun slits placed around the OSO wheel. Data were obtained from one of the 22.5° sector intervals plus the sun sector at any given time. Both day and night data were accumulated in the onboard tape recorder, thereby enabling nearly continuous information retrieval.

The reduced data from this experiment are on three reels of magnetic tape in the BCD mode at a density of 556 bpi with 960 characters per record. A total of 614 hr of good daytime data and 318 hr of nighttime data are available from the first 1039 passes which covered the time period March 7 to May 15, 1962.

Data include:

1. Pass number
2. Universal time
3. Latitude, longitude, altitude, B, L
4. Computed trapped radiation environment
5. Decommutated digital data
6. Rates and ID for each data frame
7. Spin axis and solar vector, right ascension and declination
8. Pitch and roll angles and spin rate
9. Sector look vector, right ascension, and declination and earth tangent plane angle

Some of the above information is not available during satellite night.

Gamma-Ray Monitor (0.5 Mev)

Investigator:
K. Frost–Goddard Space Flight Center

Three scintillator detectors were placed on the OSO 1 satellite to monitor gamma rays in the 0.1- to 0.7-Mev range. These instruments operated in the sunlit portions of the satellite orbit and consisted of an unshielded CsI crystal which viewed the sun continuously during sunlit operation and two NaI crystals which viewed the sunfield for part of each spin of the satellite. The sunfield view of one of the spinning scintillators was collimated with tungsten shielding. The other spinning scintillator was unshielded. The output from each of the three scintillators was sampled sequentially through the 16 levels of a pulse height analyzer, representing the 0.1- to 0.7-Mev range. The detector system was calibrated in the laboratory with a 0.5-Mev source. After the hundredth orbit, a change in gain of the system was deduced from a channel shift of the predominant 0.5-Mev gamma rays. For each spin of the satellite, the spinning detectors passed through varying views of the sunfield. The data from these detectors were reduced in two ways. One gives the spectra for a detector viewing the sunfield, and the other for the detector turned from the sunview. The pointed detector gives the spectra for a direct sunview.

The reduced data from this experiment are in the form of printouts of two-dimension arrays representing the 0.1- to 0.7-Mev gamma-ray spectra during the sunlight portion of an OSO 1 orbit. Nine rolls of 35-mm microfilm containing these data are available at NSSDC for the period of March 7 to May 15, 1962, covering orbits 1 to 1037 (not inclusive).

Data include:

1. Time of observation (UT)
2. Pass number
3. Detector
4. Average number gamma rays/energy level

PART V. ROCKET EXPERIMENTS

A. Introduction

The listing of rockets in this section was generated from a card-oriented, machine-sensible file maintained at NSSDC.

This listing indexes all reports of successful rocket launches on file at NSSDC. Partially successful launches are flagged with the letter P. Some data from these rocket experiments are held at NSSDC. If a request is made for data which are not currently on hand, the Data Center staff will attempt to acquire data to satisfy individual requests.

The rocket card file is sorted by field, discipline, and launch date. The computer printout appearing on the following pages identifies the rockets and types of experiments for the convenience of those desiring rocket data.

At the bottom of each printout page, asterisks indicate whether data are available at NSSDC. One asterisk indicates that data are available; two asterisks indicate that data are available and that a more complete description of the experiment is given in Section V-C.

Abbreviations for launch sites and organizations appearing in the listing can be found in the *Introduction* to the *Catalog.*

ROCKET IDENTIFICATION SYSTEM

Numbering System:

1 - - (AEROBEE 100)
2 - - (ARCON)
3 - - (NIKE ASP)
4 - - (AEROBEE 150, 150A)
5 - - (IRIS)
6 - - (AEROBEE 300)
7 - - (ARGO E-5)
8 - - (JAVELIN)
9 - - (SKYLARK)
10 - - (NIKE CAJUN)
11 - - (JOURNEYMAN)
12 - - (SPECIAL PROJECTS)
14 - - (NIKE APACHE)
15 - - (ARCAS)
16 - - (ASTROBEE 1500)
17 - - (AEROBEE 350)
18 - - (NIKE TOMAHAWK)

Identifying Letters:

The letters which follow each rocket number in the printouts identify:

INSTRUMENTING AGENCY	EXPERIMENT
G - Goddard	A - Aeronomy
N - Other NASA Centers	E - Energetic Particles and Fields
U - College or University	I - Ionospheric Physics
D - DOD	S - Solar Physics
A - Other Government Agency	G - Galactic Astronomy
C - Industrial Corporations	R - Radio Astronomy
I - International	B - Biological
	P - Special Projects
	T - Test and Support
	M - Meteorology

B. Computer Listing of Rocket Experiments

(On Following Pages)

AERONOMY	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (LT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
AIRGLOW	1.14NA	11/20/62	1655	WSMR	21	C.A. BARTH	JPL	F
	4.76UA	11/12/63	1858	WI	219	W.G. FASTIE	JHU	
	4.85NA	11/17/63	1815	WI	185	J.B. PEARCE	JPL	
	4.124UA	02/27/64	0318	FC	161	W.G. FASTIE	JHU	
	4.115NA	09/18/64	1717	WI	168	C.A. BARTH	JPL	
	8.34LA	11/05/64	1903	WI	866	W.G. FASTIE	JHU	P
	4.83GA	12/01/64	0615	WSMR	182	J.P. HENNES	GSFC	
	4.125LA	12/17/64	0655	WSMR	234	W.G. FASTIE	JHU	
	14.142NA	01/07/65	0350	WI	146	A.E. POTTER	LERC	*
	14.132NA	04/01/65	0207	WI	140	A.E. POTTER	LERC	* F
	14.133NA	08/19/65	0140	WI	144	A.E. POTTER	LERC	* P
	4.150GA	09/28/65	0910	WSMR	183	O.E. BERG	GSFC	
	4.143NA	04/14/66	1500	WSMR	183	C.A. BARTH	COLO	
	14.284CA	02/21/68	2317	WI	150	J. PRESSMAN	GCA	P
	14.350CA	02/27/68	0110	WI	154	J. PRESSMAN	GCA	F
ALEEDC	4.115NA	09/18/64	1717	WI	168	C.A. BARTH	JPL	
ATMOSPHERIC DENSITY/COMP	4.09GA	04/29/60	1547	WI	242			
	8.04CA	11/09/60	2044	WI	982	M. DUBIN	LKHD	
	4.14GA	11/15/60	1641	WI	217	H.A. TAYLOR	GSFC	**
	10.50UA	06/06/61	2148	WI	150	H.J. SCHULTE	MICH	*
	10.56UA	06/09/61	1802	WI	143	E.J. SCHAEFFER	MICH	
	1.08GA	09/23/61	1827	FC	84	W. LLOYD	VAR	
	1.09GA	09/30/61	0842	FC	73	W. LLOYD	VAR	
	8.23CA	10/10/61	1740	WI	784	H.A. TAYLOR	GSFC	
	1.07GA	10/17/61	2012	FC	65	W. WHEELER	VAR	
	1.11GA	11/02/61	1728	FC	68	R. JEPSON	VAR	
	1.12GA	11/05/61	2011	FC	71	R. JEPSON	VAR	
	10.90UA	02/20/62	1523	WI	132	E.J. SCHAEFFER	MICH	P
	10.91UA	05/18/62	1801	WI	132	E.J. SCHAEFFER	MICH	*
	6.06GA	11/20/62	2141	WI	344	L.H. BRACE	GSFC	
	14.08UA	03/28/63	0754	WI	192	E.J. SCHAEFFER	MICH	*
	6.07GA	04/18/63	2100	WI	342	G.R. CARIGNAN	MICH	
	6.08GA	07/20/63	2155	WI	334	G.R. CARIGNAN	MICH	

* DATA AT NSSDC. ** DATA AT NSSDC. DESCRIPTION IN FOLLOWING SECTION. P INDICATES PARTIAL SUCCESS.

AERONOMY	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
ATMOSPHERIC DENSITY/COMP	10.74UA	08/02/63	2333	WI	147	W.H. HANSEN	MICH	
	10.131UA	11/26/63	1844	WI	129	W.H. HANSEN	MICH	
	14.10UA	11/26/63	1816	WI	165	E.J. SCHAEFFER	MICH	*
	6.09GA	01/29/64	0309	WI	308	G.R. CARIGNAN	MICH	
	10.142UA	05/17/64	2315	WI	150	W.H. HANSEN	MICH	
	6.10GA	07/28/64	2114	FC	322	G.R. CARIGNAN	MICH	
	8.03CA	10/08/64	0532	WI	1004	G. SHARP	LKHD	* P
	4.45GA	11/16/64	1818	WI	188	G.R. CARIGNAN	MICH	
	14.233UA	11/17/64	1749	WI	219	W.H. HANSEN	MICH	* P
	10.153UA	11/17/64	2110	WI	149	W.H. HANSEN	MICH	P
	4.111NA	01/13/65	2348	WI	178	C.A. BARTH	JPL	
	14.11UA	02/18/65	2009	FC	N/A	E.J. SCHAEFFER	MICH	*
	10.155LA	02/26/65	2133	CRO	N/A	W.H. HANSEN	MICH	
	14.98UA	03/11/65	0935	CRO	N/A	E.J. SCHAEFFER	MICH	*
	10.156UA	03/11/65	1038	CRO	N/A	W.H. HANSEN	MICH	
	14.99UA	03/11/65	2007	CRO	N/A	E.J. SCHAEFFER	MICH	*
	6.11GA	03/20/65	0542	WI	327	G.R. CARIGNAN	MICH	
	4.127UA	04/15/65	1045	WSMR	198	A.O.C. NIER	MINN	
	14.100UA	04/15/65	1802	CRO	N/A	E.J. SCHAEFFER	MICH	*
	4.128UA	07/15/65	2050	WSMR	196	A.O.C. NIER	MINN	
	10.154LA	08/07/65	1830	WI	167	J.W. PETERSON	MICH	
	10.157UA	08/08/65	0840	WI	165	J.W. PETERSON	MICH	
	8.11LA	08/25/65	1831	WI	902	K.R. DAMON	AVCO	P
	10.158UA	01/25/66	0152	WI	167	J.W. PETERSON	MICH	
	10.159LA	02/03/66	1831	WI	131	J.W. PETERSON	MICH	
	10.143UA	02/04/66	0154	WI	152	J.W. PETERSON	MICH	
	4.162UA	02/20/66	0530	FC	165	W.G. FASTIE	JHU	
	8.12UA	07/12/66	2100	WI	1015	K.R. DAMON	SYRA	
	18.06GA	08/26/66	1851	WI	308	G.R. CARIGNAN	MICH	
	18.22GA	08/28/66	0700	WI	301	G.R. CARIGNAN	MICH	
	4.181UA	11/30/66	1145	WSMR	219	A.O.C. NIER	MINN	
	4.180UA	12/02/66	2105	WSMR	227	A.O.C. NIER	MINN	
	4.179UA	06/21/67	1949	WSMR	210	A.O.C. NIER	MINN	
	4.211UA	07/20/67	1924	WSMR	210	A.O.C. NIER	MINN	

* DATA AT NSSDC. ** DATA AT NSSDC, DESCRIPTION IN FOLLOWING SECTION. P INDICATES PARTIAL SUCCESS.

AERONOMY	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
ATMOSPHERIC DENSITY/COMP	4.212UA	07/20/67	0900	WSMR	207	A.O.C. NIER	MINN	
	4.207UA	08/08/67	1257	WSMR	289	L.M. JONES	MICH	
	15.17DA	08/21/67	1932	PTMU	53	C.L. HEMENWAY	NOTS	
	15.37DA	09/20/67	0000	BARK	53	A.J. KRUEGER	NOTS	
	15.38DA	10/13/67	2141	BARK	59	A.J. KRUEGER	NOTS	
	15.40DA	10/22/67	2046	BARK	59	A.J. KRUEGER	NOTS	
	14.284CA	02/21/68	2317	WI	150	J. PRESSMAN	GCA	P
	14.350CA	02/27/68	0110	WI	154	J. PRESSMAN	GCA	P
AURORA	10.79NA	04/05/62	0431	WI	70	A.E. POTTER	LERC	P
	10.80NA	01/17/63	0144	WI	75	A.E. POTTER	LERC	
	4.124UA	02/27/64	0318	FC	161	W.G. FASTIE	JHU	
	4.129UA	02/19/65	0451	FC	159	W.G. FASTIE	JHU	
	4.162UA	02/20/66	0530	FC	165	W.G. FASTIE	JHU	
	4.163UA	02/17/67	0418	FC	160	W.G. FASTIE	JHU	
	18.66UA	12/05/67	0324	FC	N/A	W.B. MURCRAY	ULA	
	4.217UA	02/09/68	0441	FC	155	T.M. DONAHUE	PITT	
CLOUD COVER	10.138GA	08/07/64	0015	KRON	130	G. WITT	STKU	P
COMMUNICATIONS SYSTEMS	10.75UA	08/02/63	2333	WI	147	W.H. HANSEN	MICH	
COSMIC RAYS	1.08GA	09/23/61	1827	FC	84	W. LLOYD	VAR	
	1.09GA	09/30/61	0842	FC	73	W. LLOYD	VAR	
	1.07GA	10/17/61	2012	FC	65	W. WHEELER	VAR	
	1.11GA	11/02/61	1728	FC	68	R. JEPSON	VAR	
	1.12GA	11/05/61	2011	FC	71	R. JEPSON	VAR	
ELECTRIC FIELDS	8.27IA	09/24/66	0913	WI	884	D. ADAMSON	MUN	
	18.26IA	09/25/66	0951	WI	280	H. NEUSS	MUN	
ELECTRON DENSITY/TEMP	8.23CA	10/10/61	1740	WI	784	H.A. TAYLOR	GSFC	
	10.64GA	12/21/61	1954	WI	131	N.W. SPENCER	MICH	
	6.06GA	11/20/62	2141	WI	344	L.H. BRACE	GSFC	
	6.07GA	04/18/63	2100	WI	342	G.R. CARIGNAN	MICH	
	6.08GA	07/20/63	2155	WI	334	G.R. CARIGNAN	MICH	
	6.09GA	01/29/64	0309	WI	308	G.R. CARIGNAN	MICH	

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AERONOMY	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
ELECTRON DENSITY/TEMP	6.10GA	07/28/64	2114	FC	322	G.R. CARIGNAN	MICH	
	14.194CA	10/06/64	1023	WI	160	J.F. BEDINGER	GCA	*
	14.195CA	10/17/64	2304	WI	172	J.F. BEDINGER	GCA	*
	14.197GA	11/01/64	0600	FC	N/A	J.F. BEDINGER	GCA	
	4.45GA	11/16/64	1818	WI	188	G.R. CARIGNAN	MICH	
	4.132GA	12/16/64	1430	WSMR	208	O.E. BERG	GSFC	
	14.196CA	02/28/65	0021	FC	170	L.G. SMITH	GCA	
	14.198CA	02/28/65	0330	FC	S	L.G. SMITH	GCA	P
	14.200CA	02/28/65	1211	FC	55	L.G. SMITH	GCA	P
	18.01GA	03/19/65	1809	WI	325	G.R. CARIGNAN	MICH	
	12.05GA	03/19/65	1809	WI	315	G.R. CARIGNAN	MICH	
	12.05GA	03/19/65	1809	WI	315	G.R. CARIGNAN	MICH	
	6.11GA	03/20/65	0542	WI	327	G.R. CARIGNAN	MICH	
	14.201CM	06/23/65	0400	WI	164	L.G. SMITH	GCA	*
	14.202CA	10/05/65	2321	FC	206	L.G. SMITH	GCA	
	18.03GA	11/09/65	1916	FC	328	G.R. CARIGNAN	MICH	
	18.06GA	08/26/66	1851	WI	308	G.R. CARIGNAN	MICH	
	14.281CA	09/16/66	0300	FC	185	L.G. SMITH	GCA	
	4.207UA	08/08/67	1257	WSMR	289	L.M. JONES	MICH	
	18.50GA	09/18/67	1910	WSMR	286	N.W. SPENCER	GSFC	
	14.284CA	02/21/68	2317	WI	150	J. PRESSMAN	GCA	P
	14.350CA	02/27/68	0110	WI	154	J. PRESSMAN	GCA	P
GRENADE	10.05GA	09/20/60	2018	WI	19	W. NORDBERG	GSFC	P
	10.06GA	12/14/60	1652	WI	110	W. NORDBERG	GSFC	P
	10.113GA	08/18/64	0125	WI	120	W.S. SMITH	GSFC	*
	10.07GA	02/14/61	2350	WI	130	W. NORDBERG	GSFC	*
	10.08GA	02/17/61	0226	WI	84	W. NORDBERG	GSFC	*
	10.33	04/05/61	0757	WI	114	W. NORDBERG	GSFC	*P
	10.34	04/27/61	2232	WI	18	W.S. SMITH	GSFC	*P
	10.02	05/05/61	2300	WI	112	W.S. SMITH	GSFC	*
	10.28GA	05/06/61	0454	WI	114	W.S. SMITH	GSFC	*
	10.29GA	05/09/61	1153	WI	116	W.S. SMITH	GSFC	
	10.30GA	07/13/61	2207	WI	118	W.S. SMITH	GSFC	*

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AERONOMY	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
GRENADE	10.31GA	07/14/61	1602	WI	101	W.S. SMITH	GSFC	*P
	10.32GA	07/20/61	0530	WI	128	W.S. SMITH	GSFC	*
	10.36GA	09/16/61	2355	WI	88	W. NORDBERG	GSFC	* P
	10.37GA	09/17/61	1013	WI	93	W.S. SMITH	GSFC	P
	10.38GA	03/02/62	0005	WI	112	W.S. SMITH	GSFC	*
	10.39GA	03/02/62	1115	WI	114	W.S. SMITH	GSFC	*
	10.40GA	03/23/62	2354	WI	121	W.S. SMITH	GSFC	*
	10.41GA	03/28/62	0004	WI	122	W.S. SMITH	GSFC	*
	10.42GA	04/17/62	0928	WI	118	W.S. SMITH	GSFC	*
	10.43GA	06/07/62	0005	WI	120	W.S. SMITH	GSFC	*
	10.44GA	06/08/62	0053	WI	117	W.S. SMITH	GSFC	*
	10.45GA	12/01/62	2125	WI	124	W.S. SMITH	GSFC	*
	10.46GA	12/04/62	0719	WI	51	W.S. SMITH	GSFC	*P
	10.47GA	12/04/62	0707	FC	111	J.S. THEON	GSFC	*
	10.66GA	12/06/62	0532	WI	119	W.S. SMITH	GSFC	*
	10.48GA	12/06/62	0542	FC	114	J.S. THEON	GSFC	*
	10.58GA	02/20/63	2347	WI	112	W.S. SMITH	GSFC	*
	10.53GA	02/20/63	2334	FC	113	J.S. THEON	GSFC	*
	10.59GA	02/28/63	2211	WI	103	W.S. SMITH	GSFC	*
	10.54GA	02/28/63	2147	FC	113	J.S. THEON	GSFC	*
	10.60GA	03/09/63	0001	WI	112	W.S. SMITH	GSFC	*
	10.55GA	03/09/63	0001	FC	117	J.S. THEON	GSFC	*
	10.61GA	12/07/63	1311	WI	104	W.S. SMITH	GSFC	*
	10.81GA	01/24/64	0016	WI	128	W.S. SMITH	GSFC	*
	10.89GA	01/29/64	0418	AI	124	J.S. THEON	GSFC	*
	10.62GA	01/29/64	0417	FC	123	W.S. SMITH	GSFC	*
	10.63GA	02/04/64	0146	WI	116	W.S. SMITH	GSFC	*
	10.87GA	02/05/64	0320	WI	119	W.S. SMITH	GSFC	*
	10.82GA	02/05/64	0440	FC	125	W.S. SMITH	GSFC	*
	10.88GA	02/13/64	0455	AI	122	J.S. THEON	GSFC	*
	10.136GA	02/13/64	0430	FC	119	W.S. SMITH	GSFC	*
	10.137GA	03/07/64	0245	WI	115	W.S. SMITH	GSFC	*
	10.83GA	04/18/64	0059	WI	126	W.S. SMITH	GSFC	*

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AGENCY	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
GRENADE	10.73GA	04/18/64	0039	FC	127	W.S. SMITH	GSFC	*
	10.114GA	08/05/64	0207	AI	27	W.S. SMITH	GSFC	P
	10.78GA	08/07/64	0100	WI	118	W.S. SMITH	GSFC	*
	10.138GA	08/07/64	0015	KRON	130	G. WITT	STKU	P
	10.104GA	08/08/64	0400	FC	139	W.S. SMITH	GSFC	*
	10.105GA	08/12/64	0215	FC	125	W.S. SMITH	GSFC	*
	10.84GA	08/12/64	0149	WI	116	W.S. SMITH	GSFC	*
	10.115GA	08/16/64	0553	AI	124	J.S. THEON	GSFC	*
	10.140GA	08/16/64	0113	KRON	135	G. WITT	STKU	
	10.88GA	08/16/64	0315	WI	122	W.S. SMITH	GSFC	*
	10.116GA	08/17/64	1255	AI	122	J.S. THEON	GSFC	*
	10.141GA	08/17/64	0049	KRON	129	G. WITT	STKU	
	10.106GA	08/18/64	0115	FC	125	W.S. SMITH	GSFC	*
	10.107GA	11/05/64	1700	WI	123	J.S. THEON	GSFC	*
	10.134GA	11/06/64	0520	WI	121	J.S. THEON	GSFC	*
	10.133GA	11/06/64	0002	WI	120	W.S. SMITH	GSFC	*
	10.135GA	11/06/64	1000	WI	125	J.S. THEON	GSFC	*
	10.117GA	11/19/64	1902	WI	125	W.S. SMITH	GSFC	*
	10.118GA	01/27/65	2223	WI	118	W.S. SMITH	GSFC	*
	10.121GA	01/27/65	2223	FC	125	W.S. SMITH	GSFC	*
	10.124GA	01/27/65	2132	PB	N/A	J.S. THEON	GSFC	*
	10.119GA	02/04/65	0510	WI	118	W.S. SMITH	GSFC	*
	10.125GA	02/04/65	0445	PB	121	J.S. THEON	GSFC	*
	10.122GA	02/04/65	1734	FC		W.S. SMITH	GSFC	*
	10.120GA	02/08/65	2253	WI	107	W.S. SMITH	GSFC	*
	10.123GA	02/08/65	2259	FC	125	W.S. SMITH	GSFC	*
	10.126GA	02/08/65	2215	PR	124	J.S. THEON	GSFC	*
	10.94UA	04/29/65	1732	SON	N/A	W.R. WITT JR	GSFC	P
IONOSPHERIC COMP/PROPAGT	8.04CA	11/09/60	2044	WI	982	M. DUBIN	LKHD	
	8.23CA	10/10/61	1740	WI	784	H.A. TAYLOR	GSFC	
	5.04CA	05/03/62	1803	WI	112	H.A. TAYLOR	GSFC	P
	8.31DA	01/17/64	0501	WI	945	J.F. HOFFMAN	NRL	*
	8.03CA	10/08/64	0532	WI	1004	G. SHARP	LKHD	* P
	8.32DA	08/15/66	1628	WI	699	C.Y. JOHNSON	NRL	P

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AERONOMY	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
IONOSPHERIC COMP/PROPAGT	4.207UA	08/08/67	1257	WSMR	289	L.M. JONES	MICH	
MAGNETIC FIELDS	14.03UA	07/14/61	0159	WI	200	L.J. CAHILL	NHU	*
	14.04UA	07/14/61	1500	WI	200	L.J. CAHILL	NHU	*
	14.05UA	07/20/61	1312	WI	198	L.J. CAHILL	NHU	
MICROMETEORITES	14.54DA	05/28/64	0215	WSMR	49	R.K. SOBERMAN	CRL	* P
	14.55DA	08/06/64	2329	KRCN	124	R.K. SOBERMAN	CRL	P
	14.56DA	08/12/64	0045	KRCN	121	R.K. SOBERMAN	CRL	
	14.57DA	08/16/64	0053	KRCN	119	R.K. SOBERMAN	CRL	P
	14.58DA	08/17/64	0029	KRCN	124	R.K. SOBERMAN	CRL	
	4.132GA	12/16/64	1430	WSMR	208	O.E. BERG	GSFC	
	10.144UA	08/11/65	1149	WSMR	129	C.L. HEMENWAY	DUDL	P
	4.150GA	09/28/65	0910	WSMR	183	O.E. BERG	GSFC	
	4.119NA	11/16/65	1600	WSMR	144	N.H. FARLOW	ARC	
	14.78UA	11/18/65	1431	WSMR	149	C.L. HEMENWAY	DUDL	*
	14.78UA	11/18/65	1431	WSMR	149	C.L. HEMENWAY	DUDL	*
	14.170UA	08/15/66	2135	WSMR	160	C.L. HEMENWAY	DUDL	
	14.170UA	08/15/66	2135	WSMR	160	C.L. HEMENWAY	DUDL	
	4.161NA	10/22/66	1520	WSMR	149	N.H. FARLOW	ARC	
	4.155GA	10/25/66	1725	WSMR	186	O.E. BERG	GSFC	
	4.222NA	06/06/67	1420	WSMR	138	N.H. FARLOW	ARC	
	4.223NA	08/11/67	0900	WSMR	141	N.H. FARLOW	ARC	
NEUTRAL PARTICLES	10.90UA	02/20/62	1523	WI	132	E.J. SCHAEFFER	MICH	P
	10.79NA	04/05/62	0431	WI	70	A.E. POTTER	LERC	P
	10.91UA	05/18/62	1801	WI	132	E.J. SCHAEFFER	MICH	*
	6.06GA	11/20/62	2141	WI	344	L.H. BRACE	GSFC	
	10.80NA	01/17/63	0144	WI	75	A.E. POTTER	LERC	
	6.07GA	04/18/63	2100	WI	342	G.R. CARIGNAN	MICH	
	6.08GA	07/20/63	2155	WI	334	G.R. CARIGNAN	MICH	
	6.09GA	01/29/64	0309	WI	308	G.R. CARIGNAN	MICH	
	6.10GA	07/28/64	2114	FC	322	G.R. CARIGNAN	MICH	
	4.45GA	11/16/64	1818	WI	188	G.R. CARIGNAN	MICH	
	14.95UA	02/19/65	0917	FC	167	E.J. SCHAEFFER	MICH	*

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AERONOMY	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
NEUTRAL PARTICLES	18.01GA	03/19/65	1809	WI	325	G.R. CARIGNAN	MICH	
	12.05GA	03/19/65	1809	WI	315	G.R. CARIGNAN	MICH	
	12.05GA	03/19/65	1809	WI	315	G.R. CARIGNAN	MICH	
	6.11GA	03/20/65	0542	WI	327	G.R. CARIGNAN	MICH	
	18.03GA	11/09/65	1916	FC	328	G.R. CARIGNAN	MICH	
	18.02GA	11/10/65	0700	FC	328	G.R. CARIGNAN	MICH	
	14.96UA	07/11/66	1918	FC	202	E.J. SCHAEFFER	MICH	
	18.05GA	08/26/66	1831	WI	287	G.R. CARIGNAN	MICH	
	18.22GA	08/28/66	0700	WI	301	G.R. CARIGNAN	MICH	
	4.207UA	08/08/67	1257	WSMR	289	L.M. JONES	MICH	
	18.50GA	09/18/67	1910	WSMR	286	N.W. SPENCER	GSFC	
PITOT-STATIC TUBE	14.19CA	06/06/62	2340	WI	124	J.J. HORVATH	MICH	
	14.20UA	12/01/62	2034	WI	132	J.J. HORVATH	MICH	*
	14.21UA	12/07/63	1343	WI	140	J.J. HORVATH	MICH	*
	14.22UA	02/04/64	0135	AI	158	J.J. HORVATH	MICH	*
	14.24UA	04/15/64	0122	AI	156	J.J. HORVATH	MICH	*
	14.24UA	04/15/64	0122	AI	156	J.J. HORVATH	MICH	*
	14.23UA	04/15/64	1556	AI	158	J.J. HORVATH	MICH	*
	14.64UA	03/08/65	1748	CRO	N/A	J.J. HORVATH	MICH	*
	14.65UA	03/09/65	0626	CRO	N/A	J.J. HORVATH	MICH	*
	10.156UA	03/11/65	1038	CRO	N/A	W.H. HANSEN	MICH	
	14.66UA	04/04/65	1606	CRO	N/A	J.J. HORVATH	MICH	*
	14.26UA	04/06/65	1634	CRO	N/A	J.J. HORVATH	MICH	*
	14.63UA	04/09/65	2026	CRO	N/A	J.J. HORVATH	MICH	*
	14.66UA	04/13/65	0405	CRO	N/A	J.J. HORVATH	MICH	*
	14.27UA	04/13/65	1600	CRO	N/A	J.J. HORVATH	MICH	
	14.25UA	04/15/65	1600	CRO	140	J.J. HORVATH	MICH	
	14.47UA	05/22/65	0202	AI	158	J.J. HORVATH	MICH	*
	14.48UA	05/22/65	1400	AI	158	J.J. HORVATH	MICH	*
	14.165UA	11/10/65	0630	FC	N/A	G.R. CARIGNAN	MICH	P
	14.26UA	04/10/66	1634	CRO	N/A	J.J. HORVATH	MICH	
	18.06GA	08/26/66	1851	WI	308	G.R. CARIGNAN	MICH	
PLANETARY STUDIES	14.102NA	10/09/63	2314	WI	158	A.E. POTTER	LERC	*

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AERONOMY	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (LT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
PLANETARY STUDIES	14.103NA	10/10/63	2313	WI	157	A.E. POTTER	LERC	*
	4.142NA	10/19/65	2000	WI	179	C.A. BARTH	COLO	P
	4.164UA	10/21/65	1600	WI	191	W.G. FASTIE	JHU	
	4.165UA	04/21/66	1125	WSMR	155	W.G. FASTIE	JHU	P
	4.197UA	12/05/67	1130	WSMR	155	W.G. FASTIE	JHU	
POSITIVE IONS	8.23CA	10/10/61	1740	WI	784	H.A. TAYLOR	GSFC	
	14.110CA	05/08/63	1723	WI	168	G. SHARP	LKHD	* P
	8.31DA	01/17/64	0501	WI	945	J.H. HOFFMAN	NRL	*
	14.11UA	02/18/65	2009	FC	N/A	E.J. SCHAEFFER	MICH	*
	14.95UA	02/19/65	0917	FC	187	E.J. SCHAEFFER	MICH	*
	14.62UA	03/18/65	2043	WI	158	T.W. FLOWERDAY	SCAS	* P
	18.01GA	03/19/65	1809	WI	325	G.R. CARIGNAN	MICH	
	18.03GA	11/09/65	1916	FC	328	G.R. CARIGNAN	MICH	
	18.02GA	11/10/65	0700	FC	328	G.R. CARIGNAN	MICH	
	8.25GI	03/02/66	1759	WI	496	D. PELZ	GSFC	
	14.96UA	07/11/66	1918	FC	202	E.J. SCHAEFFER	MICH	
	8.32DA	08/15/66	1828	WI	699	C.Y. JOHNSON	NRL	P
	18.05GA	08/26/66	1831	WI	287	G.R. CARIGNAN	MICH	
	8.43UA	05/17/67	2058	WI	1006	K.R. DAMON	SYRA	
	4.207UA	08/08/67	1257	WSMR	289	L.M. JONES	MICH	
STELLAR/SOLAR FLUXES	15.37DA	09/20/67	0000	BARK	53	A.J. KRUEGER	NOTS	
	15.38DA	10/13/67	2141	BARK	59	A.J. KRUEGER	NOTS	
	15.40DA	10/22/67	2046	BARK	59	A.J. KRUEGER	NOTS	
STELLAR/SOLAR SPECTRA	4.197UA	12/05/67	1130	WSMR	155	W.G. FASTIE	JHU	
SYSTEMS TEST	10.64GA	12/21/61	1954	WI	131	N.W. SPENCER	MICH	
	14.54DA	05/28/64	0215	WSMR	49	R.K. SOBERMAN	CRL	* P
ULTRAVIOLET	1.14NA	11/20/62	1655	WSMR	21	C.A. BARTH	JPL	P
	4.76UA	11/12/63	1858	WI	219	W.G. FASTIE	JHU	
	8.31DA	01/17/64	0501	WI	945	J.H. HOFFMAN	NRL	*
	4.115NA	09/18/64	1717	WI	168	C.A. BARTH	JPL	
	4.83GA	12/01/64	0615	WSMR	182	J.P. HENNES	GSFC	
	4.111NA	01/13/65	2348	WI	178	C.A. BARTH	JPL	

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AERONOMY	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
ULTRAVIOLET	4.129UA	02/19/65	0451	FC	159	W.G. FASTIE	JHU	
	4.112NA	06/29/65	1900	WSMR	195	C.A. BARTH	JPL	
	4.142NA	10/19/65	2000	WI	179	C.A. BARTH	COLO	P
	4.164UA	10/21/65	1600	WI	191	W.G. FASTIE	JHU	
	4.143NA	04/14/66	1500	WSMR	183	C.A. BARTH	COLO	
	4.165UA	04/21/66	1125	WSMR	155	W.G. FASTIE	JHU	P
	8.32DA	08/15/66	1828	WI	699	C.Y. JOHNSON	NRL	P
	15.36DA	09/17/67	0015	BARK	56	A.J. KRUEGER	NOTS	
	15.37DA	09/20/67	0000	BARK	53	A.J. KRUEGER	NOTS	
	15.38DA	10/13/67	2141	BARK	59	A.J. KRUEGER	NOTS	
	15.39DA	10/19/67	2107	BARK	58	A.J. KRUEGER	NOTS	
	15.40DA	10/22/67	2046	BARK	59	A.J. KRUEGER	NOTS	
	15.41DA	10/25/67	2030	BARK	59	A. KRUEGER	NOTS	
	14.347UA	12/12/67	2148	WI	96	J.B. PEARCE	COLO	
WEATHER (TEMP/PRESSURE)	8.05CA	12/10/60	1730	WI	718	M. DUBIN	GCA	
	10.50UA	06/06/61	2148	WI	150	H.J. SCHULTE	MICH	*
	8.06CA	09/13/61	0932	WI	420	W.S. SMITH	GCA	
	8.22CA	09/13/61	2353	WI	402	W.S. SMITH	GCA	
	10.40GA	03/23/62	2354	WI	121	W.S. SMITH	GSFC	*
	10.43GA	06/07/62	0005	WI	120	W.S. SMITH	GSFC	*
	10.131UA	11/26/63	1844	WI	129	W.H. HANSEN	MICH	
	10.55GA	12/07/63	1311	WI	104	W.S. SMITH	GSFC	*
	10.142UA	05/17/64	2315	WI	150	W.H. HANSEN	MICH	
	10.153UA	11/17/64	2110	WI	149	W.H. HANSEN	MICH	P
	10.155UA	02/26/65	2133	CRO	N/A	W.H. HANSEN	MICH	
	10.156UA	03/11/65	1038	CRO	N/A	W.H. HANSEN	MICH	
	10.154UA	08/07/65	1830	WI	167	J.W. PETERSON	MICH	
	10.157UA	08/08/65	0840	WI	165	J.W. PETERSON	MICH	
	10.158UA	01/25/66	0152	WI	167	J.W. PETERSON	MICH	
	10.159UA	02/03/66	1831	WI	131	J.W. PETERSON	MICH	
	10.143UA	02/04/66	0154	WI	152	J.W. PETERSON	MICH	
	4.212IA	07/20/67	0900	WSMR	207	A.O.C. NIER	MINN	
WINDS, VAPOR RELEASE	3.13CA	08/17/59	0918	WI	236	E.R. MANRING	GCA	

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AERONOMY	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
WINDS, VAPOR RELEASE	3.15CA	11/18/59	2217	WI	250	E.R. MANRING	GCA	
	3.24CA	05/25/60	0048	WI	199	E.R. MANRING	GCA	
	10.12GA	12/09/60	0620	WI	146	J.F. BEDINGER	GCA	
	8.05CA	12/10/60	1730	WI	718	M. DUBIN	GCA	
	3.05CA	04/19/61	0936	WI	164	E.R. MANRING	GCA	P
	3.06CA	04/20/61	2312	WI	180	E.R. MANRING	GCA	
	3.08CA	04/21/61	0939	WI	164	E.R. MANRING	GCA	
	8.06CA	09/13/61	0932	WI	420	W.S. SMITH	GCA	
	8.22CA	09/13/61	2353	WI	402	W.S. SMITH	GCA	
	3.18CA	09/16/61	2335	WI	208	W.S. SMITH	GCA	
	3.19CA	09/17/61	1003	WI	174	W.S. SMITH	GCA	
	10.72NA	11/18/61	0630	WI	143	W.E. LANFORD	LARC	
	10.100CA	03/02/62	0005	WI	135	J.F. BEDINGER	GCA	*
	10.101CA	03/02/62	1054	WI	133	J.F. BEDINGER	GCA	P
	10.102CA	03/23/62	2344	WI	141	E.R. MANRING	GCA	
	10.103CA	03/27/62	0004	WI	119	J.F. BEDINGER	GCA	*
	3.20CA	04/17/62	0943	WI	202	E.R. MANRING	GCA	
	3.21CA	06/07/62	0056	WI	161	E.R. MANRING	GCA	
	14.16CA	11/07/62	1053	WI	165	E.R. MANRING	GCA	*
	14.16CA	11/07/62	1053	WI	165	E.R. MANRING	GCA	*
	14.17CA	11/30/62	1115	WI	170	E.R. MANRING	GCA	*
	14.17CA	11/30/62	1115	WI	170	E.R. MANRING	GCA	*
	14.46AA	12/03/62	2320	EGL	188	N.W. ROSENBERG	CRL	
	14.18CA	12/05/62	2216	WI	178	E.R. MANRING	GCA	* P
	14.36CA	02/20/63	2318	WI	162	J.F. BEDINGER	GCA	*
	14.39CA	02/21/63	2316	WI	168	J.F. BEDINGER	GCA	*
	14.141DA	05/18/63	0106	EGL	186	N.W. ROSENBERG	CRL	
	14.140DA	05/18/63	1006	EGL	187	N.W. ROSENBERG	CRL	
	14.13CA	05/22/63	0410	FC	233	E.R. MANRING	GCA	
	14.14CA	05/22/63	0751	FC	233	E.R. MANRING	GCA	
	14.14CA	05/22/63	0751	FC	233	E.R. MANRING	GCA	
	10.130DA	05/22/63	0110	EGL	52	N.W. ROSENBERG	CRL	
	14.15CA	05/23/63	0413	FC	223	E.R. MANRING	GCA	
	14.40CA	05/24/63	0045	WI	204	J.F. BEDINGER	GCA	*

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AGENCY	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
WINDS, VAPOR RELEASE	14.42CA	05/25/63	0047	WI	197	J.F. BEDINGER	GCA	* P
	14.128IA	11/21/63	1255	THU	170	J.F. BEDINGER	GCA	*
	14.129IA	01/08/64	1315	THU	170	P.D. BHAVSAR	AHMD	
	14.130IA	01/12/64	0026	THU	170	P.D. BHAVSAR	AHMD	
	14.106CA	01/15/64	2240	WI	113	J.F. BEDINGER	GCA	*
	14.125CA	01/16/64	0500	WI	169	J.F. BEDINGER	GCA	*
	14.126CA	01/16/64	1134	WI	197	J.F. BEDINGER	GSFC	*
	14.49CA	07/15/64	0058	WI	190	J.F. BEDINGER	GCA	
	14.50CA	07/15/64	0409	WI	192	J.F. BEDINGER	GCA	*
	14.51CA	07/15/64	0805	WI	192	J.F. BEDINGER	GCA	*
	14.52CA	07/15/64	0906	WI	192	J.F. BEDINGER	GCA	
	14.194CA	10/08/64	1023	WI	160	J.F. BEDINGER	GCA	*
	14.195CA	10/17/64	2304	WI	172	J.F. BEDINGER	GCA	*
	14.197GA	11/01/64	0600	FC	N/A	J.F. BEDINGER	GCA	
	14.131IA	11/06/64	0008	THU	192	K. MEDROW	GSFC	
	14.204IA	11/09/64	1254	THU	192	K. MEDROW	GSFC	
	14.205IA	11/10/64	0005	THU	192	K. MEDROW	GSFC	
	14.53CA	11/10/64	2228	WI	197	J.F. BEDINGER	GCA	*
	14.114CA	11/10/64	2225	WI	N/A	J.F. BEDINGER	GCA	
	14.115CA	11/11/64	2224	WI	N/A	J.F. BEDINGER	GCA	
	14.112CA	11/11/64	2227	WI	202	J.F. BEDINGER	GCA	*
	14.116GA	11/12/64	1053	WI	N/A	J.F. BEDINGER	GCA	
	14.113CA	11/12/64	1056	WI	204	J.F. BEDINGER	GCA	* P
	14.135IA	11/30/64	1311	SON	200	S. MEHMUD	PRC	*
	14.136UI	12/01/64	0120	SON	200	S. MEHMUD	PRC	*
	14.142NA	01/07/65	0350	WI	146	A.E. POTTER	LERC	*
	14.196CA	02/28/65	0021	FC	170	L.G. SMITH	GCA	
	14.198GA	02/28/65	0330	FC	5	L.G. SMITH	GCA	P
	14.200CA	02/28/65	1211	FC	55	L.G. SMITH	GCA	F
	14.132NA	04/01/65	0207	WI	140	A.E. POTTER	LERC	* P
	10.171NA	04/23/65	0301	WI	128	R.A. HORD	LARC	
	14.255NA	04/23/65	0402	WI	145	R.A. HORD	LARC	
	14.201CM	06/23/65	0400	WI	164	L.G. SMITH	GCA	*
	14.225IA	09/21/65	2200	SUR	205	J. VELDKAMPE	RNMI	

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AERONOMY	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
WINDS, VAPOR RELEASE	14.226IA	09/24/65	0852	SUR	N/A	J. VELDKAMPE	RNMI	
	14.227IA	09/27/65	0854	SUR	N/A	J. VELDKAMPE	RNMI	
	14.202CA	10/05/65	2321	FC	206	L.G. SMITH	GCA	
	14.211IA	02/25/66	1359	SON	200	M. RAHMATULLAH	PRC	
	14.212IA	02/26/66	1359	SON	200	M. RAHMATULLAH	PRC	
	14.295CM	07/17/66	0908	WI	208	J.F. BEDINGER	GCA	*
	14.278CA	09/14/66	0135	FC	161	L.G. SMITH	GCA	
	14.278CA	09/14/66	0135	FC	161	L.G. SMITH	GCA	
	14.279CA	09/14/66	0400	FC	186	L.G. SMITH	GCA	P
	14.280CA	09/16/66	0122	FC	185	L.G. SMITH	GCA	
	14.281CA	09/16/66	0300	FC	185	L.G. SMITH	GCA	
	14.282CA	09/16/66	0417	FC	207	L.G. SMITH	GCA	
	18.261A	09/25/66	0951	WI	280	H. NEUSS	MUN	
	14.77CA	11/12/66	1401	CAS	185	L.G. SMITH	GCA	
	14.313CM	02/01/67	0541	FC	154	J.F. BEDINGER	GCA	
	14.161IA	03/06/67	1327	THU	N/A	P.D. BHAVSAR	INCO	P
	14.206IA	03/12/67	1700	THU	183	P.D. BHAVSAR	AHMD	
	14.163IA	03/12/67	1327	THU	155	P.D. BHAVSAR	AHMD	P
	14.163IA	03/12/67	1327	THU	155	P.D. BHAVSAR	PRL	P
	14.283CA	03/31/67	0303	WI	176	J. PRESSMAN	GCA	P
	14.284CA	02/21/68	2317	WI	150	J. PRESSMAN	GCA	P
	14.350CA	02/27/68	0110	WI	154	J. PRESSMAN	GCA	P
BIOLOGICAL								
BIOLOGICAL	4.213NB	12/05/67	1911	WI	137	R.L. KRIEGER	WS	
GRAVITY	4.213NE	12/05/67	1911	WI	137	R.L. KRIEGER	WS	
ULTRAVIOLET	4.150GB	09/28/65	0910	WSMR	183	O.E. BERG	GSFC	

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ENERGETIC PARTICLES AND FIELDS	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
AIRGLOW	14.150UE	01/15/64	0231	WI	90	B.J. O'BRIEN	RICE	* P
	14.151UE	03/18/64	0611	FC	151	B.J. O'BRIEN	RICE	P
	14.152UE	03/20/64	0522	FC	151	B.J. O'BRIEN	RICE	
	14.153UE	03/23/64	1037	FC	153	B.J. O'BRIEN	RICE	
	14.154UE	07/09/64	0413	WI	167	B.J. O'BRIEN	RICE	*
ATMOSPHERIC DENSITY/COMP	14.118GE	03/24/64	0422	FC	188	D.S. EVANS	GSFC	**
AURORA	10.17GE	06/06/60	1610	FC	128	L. DAVIS	GSFC	
	10.18GE	07/22/60	0453	FC	128	L. DAVIS	GSFC	
	10.19GE	09/03/60	1408	FC	122	K.W. OGILVIE	GSFC	
	10.20GE	09/03/60	1729	FC	122	C.E. FICHTEL	GSFC	*
	10.21GE	09/27/60	1444	FC	128	K.W. OGILVIE	GSFC	
	10.22GE	11/11/60	1121	FC	128	C.E. FICHTEL	GSFC	
	10.23GE	11/11/60	1210	FC	128	C.E. FICHTEL	GSFC	P
	10.24GE	11/12/60	1839	FC	128	C.E. FICHTEL	GSFC	*
	10.15GE	11/12/60	1732	FC	128	C.E. FICHTEL	GSFC	*
	10.16GE	11/13/60	1002	FC	128	C.E. FICHTEL	GSFC	*
	10.13GE	11/16/60	1951	FC	128	C.E. FICHTEL	GSFC	
	10.14GE	11/17/60	0000	FC	128	C.E. FICHTEL	GSFC	
	10.26GE	11/18/60	0328	FC	128	C.E. FICHTEL	GSFC	
	10.27GE	11/18/60	2338	FC	128	C.E. FICHTEL	GSFC	
	14.43GE	02/20/64	0722	FC	204	D.S. EVANS	GSFC	P
	14.44GE	02/29/64	0532	FC	204	D.S. EVANS	GSFC	
	14.121UE	04/11/64	0629	FC	171	W.B. MURCRAY	COLL	
	14.122UE	04/15/64	0639	FC	154	W.B. MURCRAY	COLL	
	14.123UE	04/22/64	0654	FC	166	W.B. MURCRAY	COLL	
	14.207UE	04/03/65	0638	FC	205	B.J. O'BRIEN	RICE	
	14.235UE	09/17/65	1544	FC	160	K.A. ANDERSON	CALU	
	14.236UE	09/20/65	1608	FC	146	K.A. ANDERSON	CALU	
	14.237UE	09/20/65	1410	FC	24	K.A. ANDERSON	CALU	
	14.238UE	11/17/65	0425	FC	178	W.B. MURCRAY	COLL	
	14.239UE	11/20/65	0520	FC	N/A	W.B. MURCRAY	COLL	P
	14.124UE	11/24/65	0404	FC	N/A	W.B. MURCRAY	COLL	P
	14.188GE	02/10/66	0542	FC	178	D.S. EVANS	GSFC	**

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ENERGETIC PARTICLES AND FIELDS	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
AURORA	14.189GE	02/17/66	0256	FC	209	D.S. EVANS	GSFC	**
	14.190GE	03/14/66	0513	FC	N/A	D.S. EVANS	GSFC	
	18.07GE	03/23/66	0407	FC	290	K. BURROWS	GSFC	
	18.08GE	04/14/66	0555	FC	296	K. BURROWS	GSFC	
	18.23GE	01/28/67	0516	FC	177	D.S. EVANS	GSFC	P
	8.41UE	02/05/67	0616	FC	752	B.J. O'BRIEN	RICE	P
	18.24GE	03/09/67	0507	FC	224	D.S. EVANS	GSFC	P
	8.47UE	03/18/67	0547	FC	794	B.J. O'BRIEN	RICE	
	18.43GE	08/31/67	2206	AND	N/A	E. WESCOTT	GSFC	
	18.45GE	09/12/67	2057	AND	N/A	E. WESCOTT	GSFC	
	18.13UE	01/23/68	0533	FC	N/A	K.B. MATHEW	COLL	
COSMIC RAYS	10.17GE	06/06/60	1610	FC	128	L. DAVIS	GSFC	
	4.16UE	06/23/60	1701	WI	200	R.C. HAYMES	NYU	**
	10.19GE	09/03/60	1408	FC	122	K.W. OGLIVIE	GSFC	
	10.20GE	09/03/60	1729	FC	122	C.E. FICHTEL	GSFC	*
	10.23GE	11/11/60	1210	FC	128	C.E. FICHTEL	GSFC	P
	10.24GE	11/12/60	1839	FC	128	C.E. FICHTEL	GSFC	*
	10.15GE	11/12/60	1732	FC	128	C.E. FICHTEL	GSFC	*
	10.16GE	11/13/60	1002	FC	128	C.E. FICHTEL	GSFC	*
	10.13GE	11/16/60	1951	FC	128	C.E. FICHTEL	GSFC	
	10.14GE	11/17/60	0000	FC	128	C.E. FICHTEL	GSFC	
	10.26GE	11/18/60	0328	FC	128	C.E. FICHTEL	GSFC	
	10.27GE	11/18/60	2338	FC	128	C.E. FICHTEL	GSFC	
	10.76GE	12/10/61	1701	FC	130	C.E. FICHTEL	GSFC	
	4.91GE	09/04/63	1311	FC	242	C.E. FICHTEL	GSFC	*
	4.107GE	07/23/64	1843	FC	233	C.E. FICHTEL	GSFC	
	4.108GE	07/25/64	1735	FC	215	C.E. FICHTEL	GSFC	
	4.140GE	06/17/65	2107	FC	233	C.E. FICHTEL	GSFC	
	4.141GE	06/23/65	1546	FC	215	C.E. FICHTEL	GSFC	
ELECTRIC FIELDS	18.07GE	03/23/66	0407	FC	290	K. BURROWS	GSFC	
	18.08GE	04/14/66	0555	FC	296	K. BURROWS	GSFC	
	18.23GE	01/28/67	0516	FC	177	D.S. EVANS	GSFC	P
	18.24GE	03/09/67	0507	FC	224	D.S. EVANS	GSFC	P

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ENERGETIC PARTICLES AND FIELDS	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
ELECTRIC FIELDS	18.09GE	03/31/67	0001	WI	321	E. WESCOTT	GSFC	
	18.46GE	08/31/67	2247	AND	N/A	D.S. EVANS	GSFC	
	18.43GE	08/31/67	2206	AND	N/A	E. WESCOTT	GSFC	
	18.47GE	09/02/67	2042	AND	N/A	D.S. EVANS	GSFC	
	18.44GE	09/02/67	2031	AND	N/A	E. WESCOTT	GSFC	
	18.48GE	09/12/67	2059	AND	N/A	T.L. AGGSON	GSFC	P
	18.45GE	09/12/67	2057	AND	N/A	E. WESCOTT	GSFC	
	18.04GE	11/08/67	1732	WI	216	T.L. AGGSON	GSFC	P
ELECTRON DENSITY/TEMP	14.119GE	03/26/64	0330	FC	194	D.S. EVANS	GSFC	
	14.117GI	11/23/64	1707	WI	178	J.L. DONLEY	GSFC	*
	14.61UE	02/03/65	1808	WI	141	J.A. LOCKWOOD	NHU	*
	14.174GE	03/24/65	1624	CRO	N/A	A.C. AIKIN	GSFC	*
	14.185UE	04/02/65	1321	CRO	N/A	R.E. HOUSTON	NHU	*
	14.184UE	04/05/65	1942	CRO	N/A	R.E. HOUSTON	NHU	*
	14.186UE	04/13/65	1710	CRO	N/A	J.A. LOCKWOOD	NHU	* P
	14.59IE	07/07/66	0815	THU	167	T.S. SASTRY	INCO	
	14.59IE	07/07/66	0815	THU	167	T.S. SASTRY	INCO	
	14.59IE	07/07/66	0815	THU	167	T.S. SASTRY	INCO	
	14.59IE	07/07/66	0815	THU	167	T.S. SASTRY	INCO	
	14.59IE	07/07/66	0815	THU	167	T.S. SASTRY	INCO	
	14.228UI	03/20/65	1320	CRO	N/A	S.A. BOWHILL	ILL	*
	14.230UI	04/05/65	1346	CRO	N/A	S.A. BOWHILL	ILL	*P
	14.183UE	08/24/66	2100	FC	157	J.A. LOCKWOOD	NHU	
	18.27LE	11/30/66	1906	WI	359	J.A. LOCKWOOD	NHU	
	18.28UE	03/27/67	1835	NAT	N/A	J.A. LOCKWOOD	NHU	
	18.29LE	06/06/67	2219	FC	N/A	J.A. LOCKWOOD	NHU	
ELECTRONS	10.18GE	07/22/60	0453	FC	128	L. DAVIS	GSFC	
	11.06UE	02/12/63	0147	PTAR	1610	J.R. WINCKLER	MINN	
	14.15CUE	01/15/64	0231	WI	90	B.J. O'BRIEN	RICE	* P
	11.07UE	04/14/65	1439	WI	1660	J.R. WINCKLER	MINN	
	18.07GE	03/23/66	0407	FC	290	K. BURROWS	GSFC	
	18.08GE	04/14/66	0555	FC	296	K. BURROWS	GSFC	
	18.18LF	09/01/66	1656	FC	242	L.M. CHASE	CALU	

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ENERGETIC PARTICLES AND FIELDS	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
ELECTRONS	18.20UE	09/06/66	1225	FC	238	K.A. ANDERSON	CALU	
	18.21UE	09/06/66	1804	FC	243	L.M. CHASE	CALU	
	18.19UE	09/17/66	0253	FC	243	L.M. CHASE	CALU	
	14.287IE	11/11/66	0433	FC	193	E. KEPPLER	MUN	
	8.41UE	02/09/67	0616	FC	752	B.J. O'BRIEN	RICE	P
GAMMA RAYS	14.297CE	06/13/67	2308	WI	179	J. WATERS	ASE	
	14.297CE	06/13/67	2308	WI	179	J. WATERS	ASE	
HEAVY NUCLEI	4.91GF	09/04/63	1311	FC	242	C.E. FICHTEL	GSFC	*
	4.107GE	07/23/64	1843	FC	233	C.E. FICHTEL	GSFC	
	4.108GE	07/25/64	1735	FC	215	C.E. FICHTEL	GSFC	
MAGNETIC FIELDS	8.08GE	12/12/60	2236	WI	1161	J.P. HEPPNER	GSFC	
	14.06LE	09/09/63	1602	WI	171	L.J. CAHILL	NHU	
	14.79UE	01/25/64	0514	THU	164	L.J. CAHILL	NHU	
	14.80LE	01/25/64	0430	THU	164	L.J. CAHILL	NHU	
	14.81UE	01/29/64	1000	THU	167	L.J. CAHILL	NHU	
	14.82LE	01/31/64	1330	THU	167	L.J. CAHILL	NHU	
	14.155GE	06/10/64	1510	WI	146	T.N. DAVIS	GSFC	*
	14.156GE	06/25/64	1457	WI	149	T.N. DAVIS	GSFC	*
	14.157GE	06/26/64	0052	WI	168	T.N. DAVIS	GSFC	*
	14.159GE	10/08/64	1034	WI	140	T.N. DAVIS	GSFC	*
	14.160GE	03/08/65	1535	CRO	N/A	T.N. DAVIS	GSFC	*
	14.85UE	03/09/65	1625	CRO	N/A	L.J. CAHILL	CRO	*
	14.83UE	03/10/65	1600	CRO	N/A	L.J. CAHILL	NHU	*
	14.87UE	03/12/65	1330	CRO	N/A	L.J. CAHILL	NHU	*
	14.84UE	03/12/65	1600	CRO	162	L.J. CAHILL	NHU	*
	14.171GE	03/16/65	1614	CRO	N/A	T.N. DAVIS	GSFC	*
	14.172GE	03/18/65	0604	CRO	N/A	T.N. DAVIS	GSFC	*
	14.176GE	03/18/65	1601	CRO	N/A	T.N. DAVIS	GSFC	*
	14.173GE	03/26/65	1541	CRO	N/A	T.N. DAVIS	GSFC	*
	14.175GE	03/27/65	1808	CRO	N/A	T.N. DAVIS	GSFC	*
	10.143GF	03/29/65	1547	CRO	N/A	T.N. DAVIS	GSFC	
	14.70GE	03/29/65	1547	CRO	N/A	T.N. DAVIS	GSFC	
	14.70GE	03/29/65	1547	CRO	N/A	T.N. DAVIS	GSFC	

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ENERGETIC PARTICLES AND FIELDS	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
MAGNETIC FIELDS	14.242UE	11/24/65	1537	WI	169	R.C. HAYMES	RICE	*
	14.243UE	02/17/66	1616	WI	186	R.C. HAYMES	RICE	
	18.07GE	03/23/66	0407	FC	290	K. BURROWS	GSFC	
	18.08GE	04/14/66	0555	FC	296	K. BURROWS	GSFC	
	14.59IE	07/07/66	0815	THU	167	T.S. SASTRY	INCC	
	14.287IE	11/11/66	0433	FC	193	E. KEPPLER	MUN	
NEUTRAL PARTICLES	14.61UE	02/03/65	1808	WI	141	J.A. LOCKWOOD	NHU	*
	14.62UA	03/18/65	2043	WI	158	T.W. FLOWERDAY	SCAS	* P
	14.185UE	04/02/65	1321	CRO	N/A	R.E. HOUSTON	NHU	*
	14.184UE	04/05/65	1942	CRO	N/A	R.E. HOUSTON	NHU	*
	14.186UE	04/13/65	1710	CRO	N/A	J.A. LOCKWOOD	NHU	* P
	14.183UE	08/24/66	2100	FC	157	J.A. LOCKWOOD	NHU	
	18.27UE	11/30/66	1906	WI	359	J.A. LOCKWOOD	NHU	
	18.28UE	03/27/67	1835	NAT	N/A	J.A. LOCKWOOD	NHU	
	18.29UE	06/06/67	2219	FC	N/A	J.A. LOCKWOOD	NHU	
	14.297CE	06/13/67	2308	WI	179	J. WATERS	ASE	
	14.297CE	06/13/67	2308	WI	179	J. WATERS	ASE	
POSITIVE IONS	14.150UE	01/15/64	0231	WI	90	B.J. O'BRIEN	RICE	* P
	14.218UE	07/20/66	1950	FC	N/A	C.E. FICHTEL	GSFC	P
	14.219GE	09/02/66	1600	FC	N/A	M. DURGAPRASAD	GSFC	P
	14.220GE	09/02/66	2227	FC	159	M. DURGAPRASAD	GSFC	
	14.221GE	09/03/66	1724	FC	160	M. DURGAPRASAD	GSFC	
	14.297CE	06/13/67	2308	WI	179	J. WATERS	ASE	
	14.297CE	06/13/67	2308	WI	179	J. WATERS	ASE	
PROTONS	10.17GE	06/06/60	1610	FC	128	L. DAVIS	GSFC	
	10.18GE	07/22/60	0453	FC	128	L. DAVIS	GSFC	
	10.19GE	09/03/60	1408	FC	122	K.W. GOILVIE	GSFC	
	10.20GE	09/03/60	1729	FC	122	C.E. FICHTEL	GSFC	*
	10.21GE	09/27/60	1444	FC	128	K.W. GOILVIE	GSFC	
	10.22GE	11/11/60	1121	FC	128	C.E. FICHTEL	GSFC	
	10.23GE	11/11/60	1210	FC	128	C.E. FICHTEL	GSFC	P
	10.15GE	11/12/60	1732	FC	128	C.E. FICHTEL	GSFC	*

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ENERGETIC PARTICLES AND FIELDS	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (LT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
PROTONS	10.24GE	11/12/60	1839	FC	128	C.E. FICHTEL	GSFC	*
	10.16GE	11/13/60	1002	FC	128	C.E. FICHTEL	GSFC	*
	10.13GE	11/16/60	1951	FC	128	C.E. FICHTEL	GSFC	
	10.14GE	11/17/60	0000	FC	128	C.E. FICHTEL	GSFC	
	10.26GE	11/18/60	0328	FC	128	C.E. FICHTEL	GSFC	
	10.27GE	11/18/60	2338	FC	128	C.E. FICHTEL	GSFC	
	11.06UE	02/12/63	0147	PTAR	1610	J.R. WINCKLER	MINN	
	11.07UE	04/14/65	1439	WI	1660	J.R. WINCKLER	MINN	
	18.07GE	03/23/66	0407	FC	290	K. BURROWS	GSFC	
	18.08GE	04/14/66	0555	FC	296	K. BURROWS	GSFC	
	18.18UE	09/01/66	1858	FC	242	L.M. CHASE	CALU	
	18.20UE	09/06/66	1225	FC	238	K.A. ANDERSON	CALU	
	18.21UE	09/06/66	1804	FC	243	L.M. CHASE	CALB	
	18.19UE	09/17/66	0253	FC	243	L.M. CHASE	CALU	
	14.287IE	11/11/66	0433	FC	193	E. KEPPLER	MUN	
	8.41UE	02/09/67	0616	FC	752	B.J. O'BRIEN	RICE	P
RADIATION ZONES	11.01GE	09/19/60	1635	PTAR	2028	J.E. NAUGLE	GSFC	
	11.06UE	02/12/63	0147	PTAR	1610	J.R. WINCKLER	MINN	
	11.07UE	04/14/65	1439	WI	1660	J.R. WINCKLER	MINN	
	18.21UE	09/06/66	1804	FC	243	L.M. CHASE	CALB	
	8.49IE	06/16/67	1037	NAT	1100	G.F. PIEPER	GSFC	P
	8.50IE	06/17/67	0830	NAT	991	G.F. PIEPER	GSFC	P
SYSTEMS TEST	8.49IE	06/16/67	1037	NAT	1100	G.F. PIEPER	GSFC	P
	8.50IE	06/17/67	0830	NAT	991	G.F. PIEPER	GSFC	P
ULTRAVIOLET	14.121UE	04/11/64	0629	FC	171	W.B. MURCRAY	COLL	
	14.117GI	11/23/64	1707	WI	178	J.L. DONLEY	GSFC	*
	14.61UE	02/03/65	1808	WI	141	J.A. LOCKWOOD	NHU	*
	14.185UE	04/02/65	1321	CRO	N/A	R.E. HOUSTON	NHU	*
	14.184UE	04/05/65	1942	CRO	N/A	R.E. HOUSTON	NHU	*
	14.186UE	04/13/65	1710	CRO	N/A	J.A. LOCKWOOD	NHU	* P
	14.183UE	08/24/66	2100	FC	157	J.A. LOCKWOOD	NHU	
	18.271E	11/30/66	1906	WI	359	J.A. LOCKWOOD	NHU	

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ENERGETIC PARTICLES AND FIELDS	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
ULTRAVIOLET	18.28UE	03/27/67	1835	NAT	N/A	J.A. LOCKWOOD	NHU	
	18.29UE	06/06/67	2219	FC	N/A	J.A. LOCKWOOD	NHU	
WINDS, VAPOR RELEASE	14.224IA	09/18/65	2202	SUR	205	J. VELDKAMPE	RNMI	
	18.09GE	03/31/67	0001	WI	321	E. WESCOTT	GSFC	
	18.46GE	08/31/67	2247	AND	N/A	D.S. EVANS	GSFC	
	18.43GE	08/31/67	2206	AND	N/A	E. WESCOTT	GSFC	
	18.47GE	09/02/67	2042	AND	N/A	D.S. EVANS	GSFC	
	18.44GE	09/02/67	2031	AND	N/A	E. WESCOTT	GSFC	
	18.45GE	09/12/67	2057	AND	N/A	E. WESCOTT	GSFC	
	18.48GE	09/12/67	2059	AND	N/A	T.L. AGGSON	GSFC	P
X RAYS	14.61UE	02/03/65	1808	WI	141	J.A. LOCKWOOD	NHU	*
	14.185UE	04/02/65	1321	CRO	N/A	R.E. HOUSTON	NHU	*
	14.184UE	04/05/65	1942	CRO	N/A	R.E. HOUSTON	NHU	*
	14.186UE	04/13/65	1710	CRO	N/A	J.A. LOCKWOOD	NHU	* F
	14.183UE	08/24/66	2100	FC	157	J.A. LOCKWOOD	NHU	
	18.18UE	09/01/66	1858	FC	242	L.M. CHASE	CALU	
	18.20UE	09/06/66	1225	FC	238	K.A. ANDERSON	CALU	
	18.21UE	09/06/66	1804	FC	243	L.M. CHASE	CALU	
	18.19UE	09/17/66	0253	FC	243	L.M. CHASE	CALU	
	18.27IE	11/30/66	1906	WI	359	J.A. LOCKWOOD	NHU	
	18.28UE	03/27/67	1835	NAT	N/A	J.A. LOCKWOOD	NHU	
	18.29UE	06/06/67	2219	FC	N/A	J.A. LOCKWOOD	NHU	
GALACTIC ASTRONOMY								
AIRGLOW	4.30GG	03/28/63	0015	WSMR	298	A. BOGGESS	GSFC	
INFRARED	4.84UG	03/03/67	0420	WSMR	158	M.O. HARWIT	CORN	
PLANETARY STUDIES	4.126GG	08/22/64	1015	WSMR	122	A. BOGGESS	GSFC	
	4.157GG	05/05/67	0400	WSMR	159	D.S. EVANS	GSFC	*
STELLAR/SOLAR FLUXES	4.04GG	04/27/60	0318	WI	182	A. BOGGESS	GSFC	P
	4.05GG	05/27/60	0530	WI	217	A. BOGGESS	GSFC	* P
	4.06GG	06/24/60	0625	WI	211	A. BOGGESS	GSFC	

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GALACTIC ASTRONOMY	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (LT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
STELLAR/SOLAR FLUXES	9.01GG	09/18/61	1215	WOO	193	A. BOGGESS	GSFC	
	9.02CC	10/04/61	1119	WOO	194	A. BOGGESS	GSFC	
	9.03GG	11/01/61	1756	WOO	193	A. BOGGESS	GSFC	
	9.04GG	11/20/61	1804	WOO	208	A. BOGGESS	GSFC	
	4.122CG	08/29/64	0530	WSMR	177	R. GIACCONI	ASE	*
	4.123CG	10/27/64	0058	WSMR	192	R. GIACCONI	ASE	*
	4.147CG	09/22/65	1007	WSMR	200	R. GIACCONI	ASE	*
	4.229DG	11/14/67	1005	WSMR	172	G.H. CARRUTHERS	NRL	P
	4.228CG	11/20/67	1042	WSMR	144	R. GIACCONI	ASE	*
STELLAR/SOLAR PHOTOS	4.210GG	08/02/67	0430	WSMR	179	A. BOGGESS	GSFC	
STELLAR/SOLAR SPECTRA	4.11GG	11/22/60	0342	WI	169	T.P. STECHER	GSFC	
	4.54UG	10/30/62	0150	WI	188	A.D. CODE	WISC	P
	4.37GG	07/19/63	0530	WI	185	T.P. STECHER	GSFC	
	4.29GG	07/23/63	0600	WI	179	T.P. STECHER	GSFC	
	4.55UG	09/02/64	0308	WI	155	A.D. CODE	WISC	
	4.52UG	11/03/64	0757	WSMR	127	D.C. MORTON	PRIN	
	4.57GG	03/19/65	0300	WSMR	155	A. BOGGESS	GSFC	
	4.89GG	08/05/65	0323	WI	145	D.U. WRIGHT	GSFC	P
	4.151UG	10/13/65	0313	WSMR	184	D.C. MORTON	PRIN	P
	4.155GG	11/30/65	0748	WSMR	179	R. SCOLNIK	GSFC	*
	4.90GG	01/18/66	0319	WI	134	D.U. WRIGHT	GSFC	P
	4.50UG	02/02/66	1005	WSMR	175	D.C. MORTON	PRIN	
	4.171UG	05/18/66	0402	WI	210	A.D. CODE	WISC	
	4.51UG	05/24/66	0507	WSMR	132	D.C. MORTON	PRIN	P
	4.159GG	07/16/66	0532	WSMR	145	T.P. STECHER	GSFC	*
	4.176UG	09/20/66	0545	WSMR	165	D.C. MORTON	PRIN	
	4.154GG	11/21/66	1000	WSMR	165	T.P. STECHER	GSFC	
	4.160GG	03/03/67	0330	WSMR	157	T.P. STECHER	GSFC	
	4.194DG	03/17/67	0348	WSMR	193	G.R. CARRUTHERS	NRL	
	4.204GG	04/01/67	0340	WSMR	139	T.P. STECHER	GSFC	P
	4.186UG	04/07/67	0825	WSMR	176	D.C. MORTON	GSFC	P
	4.157GG	05/05/67	0400	WSMR	159	D.S. EVANS	GSFC	*
	4.203UG	05/05/67	0730	WSMR	176	D.C. MORTON	PRIN	

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GALACTIC ASTRONOMY	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
STELLAR/SOLAR SPECTRA	4.210GG	06/02/67	0430	WSMR	179	A. BOGGESS	GSFC	
	4.190UG	07/06/67	0410	WSMR	142	H.V. BRADT	MIT	
	4.158GG	10/27/67	1045	WSMR	160	D.S. EVANS	GSFC	P
	4.226UG	11/01/67	1130	WSMR	176	D.C. MORTON	PRIN	
	4.229DG	11/14/67	1005	WSMR	172	G.H. CARRUTHERS	NRL	P
	4.219GG	12/06/67	1045	WRMR	210	A. BOGGESS	GSFC	P
	4.205GG	01/26/68	0400	WSMR	160	T.P. STECHER	GSFC	P
	4.220GG	02/02/68	0610	WSMR	149	T.P. STECHER	GSFC	
ULTRAVIOLET	4.04GG	04/27/60	0318	WI	182	A. BOGGESS	GSFC	P
	4.05GG	05/27/60	0530	WI	217	A. BOGGESS	GSFC	* P
	4.06GG	06/24/60	0625	WI	211	A. BOGGESS	GSFC	
	9.01GG	09/18/61	1215	WOO	193	A. BOGGESS	GSFC	
	9.02GG	10/04/61	1119	WOO	194	A. BOGGESS	GSFC	
	9.03GG	11/01/61	1756	WOO	193	A. BOGGESS	GSFC	
	9.04GG	11/20/61	1804	WOO	208	A. BOGGESS	GSFC	
	4.37GG	07/19/63	0830	WI	185	T.P. STECHER	GSFC	
	4.126GG	08/22/64	1015	WSMR	122	A. BOGGESS	GSFC	
	4.55UG	09/02/64	0308	WI	155	A.D. CODE	WISC	
	4.52UG	11/03/64	0757	WSMR	127	D.C. MORTON	PRIN	
	4.109GG	11/07/64	1031	WSMR	213	T.P. STECHER	GSFC	
	4.110GG	11/14/64	1023	WSMR	206	T.P. STECHER	GSFC	
	4.57GG	03/19/65	0300	WSMR	155	A. BOGGESS	GSFC	
	4.89GG	05/05/65	0323	WI	145	D.U. WRIGHT	GSFC	P
	4.151UG	10/13/65	0313	WSMR	184	D.C. MORTON	PRIN	P
	4.155GG	11/30/65	0748	WSMR	179	R. SCOLNIK	GSFC	*
	4.50UG	02/02/66	1005	WSMR	175	D.C. MORTON	PRIN	
	4.171UG	05/18/66	0402	WI	210	A.D. CODE	WISC	
	4.51UG	05/24/66	0507	WSMR	132	D.C. MORTON	PRIN	P
	4.159GG	07/16/66	0532	WSMR	145	T.P. STECHER	GSFC	*
	4.176UG	09/20/66	0545	WSMR	165	D.C. MORTON	PRIN	
	4.154GG	11/21/66	1000	WSMR	165	T.P. STECHER	GSFC	
	4.172UG	08/04/67	0453	WSMR	130	A.D. CODE	WISC	
	4.160GG	03/03/67	0330	WSMR	157	T.P. STECHER	GSFC	
	4.194DG	03/17/67	0348	WSMR	193	G.R. CARRUTHERS	NRL	

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GALACTIC ASTRONOMY	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
ULTRAVIOLET	4.204GG	04/01/67	0340	WSMR	139	T.P. STECHER	GSFC	P
	4.186UG	04/07/67	0825	WSMR	176	D.C. MORTON	PRIN	P
	4.157GG	05/05/67	0400	WSMR	159	D.S. EVANS	GSFC	*
	4.203UG	05/05/67	0730	WSMR	176	D.C. MORTON	PRIN	
	4.210GG	06/02/67	0430	WSMR	179	A. BOGGESS	GSFC	
	4.158GG	10/27/67	1045	WSMR	160	D.S. EVANS	GSFC	P
	4.226UG	11/01/67	1130	WSMR	176	D.C. MORTON	PRIN	
X RAYS	4.69CG	09/30/62	0602	WI	172	P.C. FISHER	LKHD	P
	4.70CG	03/16/63	0219	WI	197	P.C. FISHER	LKHD	
	4.122CG	08/29/64	0530	WSMR	177	R. GIACCONI	ASE	*
	4.120CG	10/02/64	0235	WSMR	143	P.C. FISHER	LKHD	
	4.123CG	10/27/64	0058	WSMR	192	R. GIACCONI	ASE	*
	4.147CG	09/22/65	1007	WSMR	200	R. GIACCONI	ASE	*
	4.147CG	09/22/65	1007	WSMR	200	R. GIACCONI	ASE	*
	4.121CG	10/01/65	0130	WSMR	148	P.C. FISHER	LKHD	F
	4.148CG	03/08/66	0742	WSMR	164	R. GIACCONI	ASE	*
	4.149CG	10/12/66	0152	WSMR	144	H. GURSKY	ASE	
	4.182UG	12/13/66	0630	NAT	169	C.S. BOWYER	GSFC	
	4.190UG	07/08/67	0410	WSMR	142	H.V. BRADT	MIT	
	4.187CG	08/26/67	0436	WSMR	125	P.C. FISHER	LKHD	
	4.228CG	11/20/67	1042	WSMR	144	R. GIACCONI	ASE	*
IONOSPHERIC PHYSICS								
ATMOSPHERIC DENSITY/COMP	14.109GI	03/21/66	0003	AND	133	J.A. KANE	GSFC	
AURORA	15.02GI	03/21/65	0645	AND	76	J.A. KANE	GSFC	
	14.286UI	05/05/67	1700	FC	136	W.J. HEIKKILA	SCAS	
	14.268UI	05/05/67	1700	FC	136	W.J. HEIKKILA	SCAS	
COMMUNICATIONS SYSTEMS	4.06GI	09/11/59	1912	FC	225	J.A. KANE	GSFC	
	4.07GI	09/14/59	1728	FC	219	J.A. KANE	GSFC	
	8.21GI	05/03/62	2000	WI	845	G.P. SERBU	GSFC	
	4.58UI	04/03/63	1646	WI	236	L.H. KORDEN	SRI	**
	4.96II	04/12/63	0551	WI	200	D.G. CARTWRIGHT	CSIR	
	4.97II	05/09/63	1803	WI	203	D.G. CARTWRIGHT	CSIR	

* DATA AT NSSDC. ** DATA AT NSSDC, DESCRIPTION IN FOLLOWING SECTION. P INDICATES PARTIAL SUCCESS.

IONOSPHERIC PHYSICS	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
COMMUNICATIONS SYSTEMS	4.65GI	09/25/63	0709	WI	224	K. HIRAO	RRL	
	4.64GI	09/26/63	1443	WI	225	K. HIRAO	RRL	
	4.93II	10/17/63	1650	WI	187	C. FAYARD	CNET	
	4.94II	10/31/63	1650	WI	184	C. FAYARD	CNET	
	4.139II	09/25/65	2154	WI	192	L.R.O. STOREY	CNET	P
ELECTRON DENSITY/TEMP	4.08GI	09/11/59	1912	FC	225	J.A. KANE	GSFC	
	4.07GI	09/14/59	1728	FC	219	J.A. KANE	GSFC	
	6.01GA	03/16/60	1525	FC	335	N.W. SPENCER	MICH	
	6.02GA	06/16/60	1656	FC	322	N.W. SPENCER	MICH	
	6.03UI	08/03/60	1627	WI	415	N.W. SPENCER	MICH	
	10.25CI	12/08/60	1652	WI	155	L.G. SMITH	GCA	
	6.04UI	03/26/61	1154	WI	400	L.H. BRACE	MICH	
	8.13II	06/14/61	1902	WI	898	A.R. MOLOZZI	DRTE	
	8.15AI	06/24/61	2317	WI	1018	S. RUSSELL	AIL	*
	10.51CI	08/17/61	0306	WI	141	L.G. SMITH	GCA	
	8.17AI	10/14/61	0426	WI	1050	R.W. KNECHT	NRSB	*
	10.52CI	10/27/61	0935	WI	146	L.G. SMITH	GCA	
	10.74GI	12/21/61	2131	WI	100	J.A. KANE	GSFC	
	6.05UI	12/22/61	0424	WI	365	L.H. BRACE	MICH	
	8.16AI	02/07/62	1150	WI	915	R.W. KNECHT	NRSB	P
	10.112CI	05/16/62	1703	WI	122	G.P. SERBU	GSFC	P
	10.111CI	05/17/62	0204	WI	128	G.P. SERBU	GSFC	
	10.110GI	05/19/62	1600	WI	122	G.P. SERBU	GSFC	
	14.12CI	06/15/62	1648	WI	143	J.A. KANE	GSFC	*
	14.31GI	10/16/62	1506	WI	166	L.G. SMITH	GCA	*
	10.99CI	11/07/62	1025	WI	131	L.G. SMITH	GCA	
	10.108CI	11/30/62	1057	WI	121	L.G. SMITH	GCA	
	14.32GI	12/01/62	1806	WI	169	S.J. BAUER	GSFC	* P
	10.109CI	12/05/62	2200	WI	128	L.G. SMITH	GCA	
	14.66CI	02/27/63	1930	WI	151	L.G. SMITH	GCA	* P
	14.107GI	03/08/63	1930	WI	155	E.C. WHIPPLE	GSFC	* P
	14.97CI	03/28/63	2006	WI	162	L.G. SMITH	GCA	*
	14.108GI	04/09/63	2028	WI	163	J.A. KANE	GSFC	*
	4.56II	04/12/63	0551	WI	200	D.G. CARTWRIGHT	CSIR	

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IONOSPHERIC PHYSICS	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (LT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
ELECTRON DENSITY/TEMP	4.44GI	04/23/63	2048	WI	202	S.J. BAUER	GSFC	
	4.57II	05/09/63	1803	WI	203	D.G. CARTWRIGHT	CSIR	
	8.14GI	07/02/63	1418	WI	950	J.L. DONLEY	GSFC	*
	14.88CI	07/14/63	2103	FC	173	L.G. SMITH	GCA	
	14.91CI	07/20/63	2103	FC	198	L.G. SMITH	GCA	
	14.92CI	07/20/63	2113	FC	201	L.G. SMITH	GCA	
	14.94CI	07/20/63	2210	FC	193	L.G. SMITH	GCA	
	14.93CI	07/20/63	2140	FC	201	L.G. SMITH	GCA	P
	4.65GI	09/25/63	0709	WI	224	K. HIRAO	RRL	
	4.64GI	09/28/63	1443	WI	225	K. HIRAO	RRL	
	8.18GI	09/29/63	0237	WI	1038	J.L. DONLEY	GSFC	
	14.37GI	12/13/63	2232	WSMR	73	E.C. WHIPPLE	GSFC	P
	12.03GI	04/15/64	2325	WI	729	J.L. DONLEY	GSFC	
	14.143UI	04/16/64	2105	WI	169	A.G. OPP	NASA	*
	14.33GI	06/03/64	1845	WI	139	S.J. BAUER	GSFC	*
	14.145UI	07/15/64	0920	WI	160	L.G. SMITH	GCA	*
	14.144UI	07/15/64	0800	WI	155	L.G. SMITH	GCA	*
	14.146UI	07/15/64	1025	WI	171	L.G. SMITH	GCA	*
	14.127GI	07/16/64	1622	WI	138	R.C. STONE	GSFC	*
	14.34GI	08/26/64	1601	WI	153	S.J. BAUER	GSFC	*
	8.24II	10/19/64	1542	WI	840	K. HIRAO	RRL	
	8.24GI	10/19/64	1542	WI	840	K. HIRAO	RRL	
	8.19DI	11/05/64	2039	FC	840	H. ZANCANATA	BRL	
	8.20DI	11/07/64	0914	FC	715	H. ZANCANATA	BRL	
	14.147UI	11/10/64	1107	WI	117	L.G. SMITH	GCA	*
	14.148UI	11/19/64	2202	WI	169	L.G. SMITH	GCA	*
	14.149UI	11/19/64	2020	WI	165	L.G. SMITH	GCA	*
	14.209GI	12/16/64	1457	WSMR	194	A.C. AIKIN	GSFC	
	4.132GI	12/16/64	1430	WSMR	208	O.E. BERG	GSFC	
	14.177GI	03/16/65	1651	CRO	N/A	A.C. AIKIN	GSFC	*
	14.178GI	03/18/65	0641	CRO	N/A	A.C. AIKIN	GSFC	*
	14.179GI	03/18/65	1638	CRO	N/A	A.C. AIKIN	GSFC	*
	14.228UI	03/20/65	1320	CRO	N/A	S.A. BOWHILL	ILL	*
	14.180GI	03/24/65	1707	CRO	N/A	A.C. AIKIN	GSFC	*

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IONOSPHERIC PHYSICS	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (LT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
ELECTRON DENSITY/TEMP	14.181GI	03/26/65	1613	CRO	N/A	A.C. AIKIN	GSFC	*
	14.182GI	03/27/65	0300	CRO	N/A	A.C. AIKIN	GSFC	*
	14.230UI	04/05/65	1346	CRO	N/A	S.A. BOWHILL	ILL	*P
	14.232UI	04/12/65	1714	CRO	N/A	S.A. BOWHILL	ILL	*
	8.29UI	05/19/65	2011	WI	947	J.S. NISBET	PSU	
	8.37GI	05/26/65	1901	WI	322	E.J. MAIER	GSFC	P
	14.245UI	06/14/65	0913	WI	177	L.G. SMITH	GCA	*
	14.246UI	06/17/65	2141	WI	177	L.G. SMITH	GCA	*
	14.215AI	06/18/65	1756	WI	187	J. HUGHILL	NBSB	* P
	14.210GI	08/24/65	2159	WI	162	R.E. BOURDEAU	GSFC	*
	14.244UI	09/15/65	2028	WI	180	L.G. SMITH	GCA	*
	8.36GI	09/23/65	1436	WI	805	G.P. SERBU	GSFC	
	4.150GI	09/28/65	0910	WSMR	183	O.E. BERG	GSFC	
	8.30UI	10/05/65	0042	WI	960	J.S. NISBET	PSU	P
	8.42UI	10/10/65	0125	WI	322	J.S. NISBET	PSU	P
	18.02GA	11/10/65	0700	FC	328	G.R. CARIGNAN	MICH	
	14.247UI	12/15/65	1700	WI	183	L.G. SMITH	GSFC	**
	14.68II	12/15/65	1919	NAT	185	L.J. BLUMLE	GSFC	
	14.69II	12/18/65	0459	NAT	188	L.J. BLUMLE	GSFC	
	14.248UI	01/10/66	1714	WI	186	L.G. SMITH	GCA	*P
	8.25GI	03/02/66	1759	WI	496	D. PELZ	GSFC	
	8.25GA	03/02/66	1759	WI	496	D. PELZ	GSFC	
	14.216AI	04/04/66	1652	WI	174	W. CALVERT	NBSB	P
	14.270UI	06/14/66	0918	WI	186	S.A. BOWHILL	ILL	*
	14.166II	07/14/66	1515	WI	195	S.J. BAUER	GSFC	
	14.271UI	08/24/66	2315	WI	164	L.G. SMITH	GCA	* P
	14.272UI	08/25/66	0045	WI	169	L.G. SMITH	GCA	* P
	15.12GI	08/29/66	1238	WSMR	N/A	A. PEDERSON	GSFC	
	15.11GI	08/29/66	1337	WSMR	N/A	A. PEDERSON	GSFC	
	14.278GA	09/14/66	0135	FC	161	L.G. SMITH	GCA	
	14.279GI	09/14/66	0400	FC	186	L.G. SMITH	GCA	P
	14.280GA	09/16/66	0122	FC	185	L.G. SMITH	GCA	
	14.282GA	09/16/66	0417	FC	207	L.G. SMITH	GCA	
	8.38GI	10/06/66	2029	WI	650	R. BARRINGTON	DRTE	

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IONOSPHERIC PHYSICS	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
ELECTRON DENSITY/TEMP	10.181AI	10/25/66	1810	WSMR	119	E.C. WHIPPLE	ITSA	
	4.195GI	10/25/66	1725	WSMR	186	C.E. BERG	GSFC	
	14.77CA	11/12/66	1401	CAS	185	L.G. SMITH	GCA	
	14.302UI	11/12/66	1407	CAS	160	S.A. BOWHILL	ILL	
	14.303UI	11/12/66	1600	CAS	200	S.A. BOWHILL	ILL	
	14.304UI	11/12/66	1410	CAS	195	S.A. BOWHILL	ILL	
	14.274UI	11/12/66	1405	CAS	197	S.A. BOWHILL	ILL	
	14.77CI	11/12/66	1401	CAS	185	L.G. SMITH	GCA	
	14.275UI	01/31/67	1850	WI	195	S.A. BOWHILL	ILL	
	14.163II	03/12/67	1327	THU	155	P.D. BHAVSAR	AHMD	P
	14.206IA	03/12/67	1700	THU	183	P.D. BHAVSAR	AHMD	
	14.163II	03/12/67	1327	THU	155	P.D. BHAVSAR	PRL	P
	14.267IA	03/13/67	0014	THU	155	P.D. BHAVSAR	AHMD	P
	14.267IA	03/13/67	0014	THU	155	P.D. BHAVSAR	AHMD	P
	14.256II	03/16/67	1905	WI	141	E. SOMAYAJULU	INCO	P
	8.39GI	04/12/67	0522	FC	798	W.J. HEIKKILA	SCAS	
	8.26UI	06/21/67	1902	WI	792	W.B. HANSEN	SCAS	P
	14.273UI	08/08/67	2356	WI	141	S.A. BOWHILL	ILL	
	14.164UI	09/16/67	1554	WI	166	R.T. BETTINGER	MDU	
	8.45UI	09/21/67	0738	WI	768	D.A. GURNETT	UIA	
	14.258UI	11/16/67	1814	WI	167	R.T. BETTINGER	MDU	
	8.35UI	12/08/67	0100	FC	805	W.B. HANSON	SCAS	*
	10.275GI	01/16/68	1929	WI	141	Y.V. SOMAYAJULU	INCO	
	10.273GI	01/16/68	1914	WI	137	Y.V. SOMAYAJULU	INCO	
IONOSPHERIC COMP/PROPAGT	4.08GI	09/11/59	1912	FC	225	J.A. KANE	GSFC	
	4.07GI	09/14/59	1728	FC	219	J.A. KANE	GSFC	
	4.02II	09/17/59	1837	FC	256			
	6.01GA	03/16/60	1525	FC	335	N.W. SPENCER	MICH	
	6.02GA	06/16/60	1656	FC	322	N.W. SPENCER	MICH	
	6.03UI	08/03/60	1627	WI	415	N.W. SPENCER	MICH	
	1.01CI	11/23/60	1019	FC	91	E.C. WHIPPLE	GSFC	P
	1.02GI	11/27/60	1149	FC	85	E.C. WHIPPLE	GSFC	
	6.04UI	03/26/61	1154	WI	400	L.H. BRACE	MICH	
	8.10GI	04/27/61	1502	WI	760	S.J. BAUER	REL	* P

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IONOSPHERIC PHYSICS	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
IONOSPHERIC COMP/PROPAGT	8.13II	06/14/61	1902	WI	898	A.R. MOLOZZI	DRTE	
	8.15AI	06/24/61	2317	WI	1018	S. RUSSELL	AIL	*
	8.17AI	10/14/61	0426	WI	1050	R.W. KNECHT	NBSB	*
	8.05UI	12/22/61	0424	WI	365	L.H. BRACE	MICH	
	8.21GI	05/03/62	2000	WI	845	G.P. SERBU	GSFC	
	4.58UI	04/03/63	1646	WI	236	L.H. KORDEN	SRI	**
	4.96II	04/12/63	0551	WI	200	D.G. CARTWRIGHT	CSIR	
	4.97II	05/09/63	1803	WI	203	D.G. CARTWRIGHT	CSIR	
	8.14GI	07/02/63	1418	WI	950	J.L. DONLEY	GSFC	*
	4.59UI	07/10/63	0246	WI	212	L.H. RORDEN	SRI	*
	4.93II	10/17/63	1650	WI	187	C. FAYARD	CNET	
	4.94II	10/31/63	1650	WI	184	C. FAYARD	CNET	
	8.24II	10/19/64	1542	WI	840	K. HIRAO	GSFC	
	8.19DI	11/05/64	2039	FC	840	H. ZANGANATA	BRL	
	8.20DI	11/07/64	0514	FC	715	H. ZANGANATA	BRL	
	14.117GI	11/23/64	1707	WI	178	J.L. DONLEY	GSFC	*
	8.28UI	01/13/65	1712	WI	1006	J.S. NISBET	PSU	P
	8.29UI	05/19/65	2011	WI	947	J.S. NISBET	PSU	
	15.18GI	05/25/65	1959		88	A.C. AIKIN	GSFC	
	15.05GI	05/30/65	1900	KNZ	88	A.C. AIKIN	GSFC	
	15.07GI	05/30/65	1940	KNZ	88	A.C. AIKIN	GSFC	
	15.06GI	05/30/65	1920	KNZ	88	A.C. AIKIN	GSFC	
	15.08GI	05/30/65	2000	KNZ	88	A.C. AIKIN	GSFC	
	15.09GI	05/30/65	2020	KNZ	88	A.C. AIKIN	GSFC	
	15.10GI	05/30/65	2100	KNZ	88	A.C. AIKIN	GSFC	
	14.244UI	09/15/65	2028	WI	180	L.G. SMITH	GCA	*
	4.136II	09/17/65	2151	WI	182	L.R.O. STOREY	CNET	P
	4.139II	09/25/65	2154	WI	192	L.R.O. STOREY	CNET	P
	8.30UI	10/05/65	0042	WI	960	J.S. NISBET	PSU	P
	8.42UI	10/10/65	0125	WI	322	J.S. NISBET	PSU	P
	15.19GI	12/06/65	1358	AND	N/A	J.A. KANE	GSFC	
	15.28GI	05/20/66	0930	KOR	N/A	A.C. AIKIN	GSFC	
	15.27GI	05/20/66	0845	KOR	N/A	A.C. AIKIN	GSFC	
	15.26GI	05/20/66	0800	KOR	N/A	A.C. AIKIN	GSFC	

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IONOSPHERIC PHYSICS	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
IONOSPHERIC COMP/PROPAGT	15.29GI	05/20/66	1015	KOR	N/A	A.C. AIKIN	GSFC	
	15.30GI	05/20/66	1105	KOR	N/A	A.C. AIKIN	GSFC	
	15.31GI	05/21/66	0930	KOR	N/A	A.C. AIKIN	GSFC	
	15.11GI	08/29/66	1337	WSMR	N/A	A. PEDERSON	GSFC	
	15.12GI	08/29/66	1238	WSMR	N/A	A. PEDERSON	GSFC	
	14.302UI	11/12/66	1407	CAS	160	S.A. BOWHILL	ILL	
	14.303UI	11/12/66	1600	CAS	200	S.A. BOWHILL	ILL	
	14.304UI	11/12/66	1410	CAS	195	S.A. BOWHILL	ILL	
	8.26UI	06/21/67	1902	WI	792	W.B. HANSON	SCAS	P
	8.45UI	09/21/67	0738	WI	768	D.A. GURNETT	UIA	
	15.33GM	10/24/67	1950	RES	N/A	J.A. KANE	GSFC	P
MAGNETIC FIELDS	14.36DI	10/07/63	2000	FC	171	H. ZANCANATA	BRL	P
	8.19DI	11/05/64	2039	FC	840	H. ZANCANATA	BRL	
	14.104DI	11/05/64	2038	FC	N/A	H. ZANCANATA	BRL	
	8.20DI	11/07/64	0514	FC	715	H. ZANCANATA	BRL	
	14.105DI	11/07/64	0512	FC	134	H. ZANCANATA	BRL	
	14.59II	07/07/66	0815	THU	167	T.S. SASTRY	INCC	
	8.48UI	09/21/67	0733	WI	768	D.A. GURNETT	UIA	
MICROMETEORITES	4.132GI	12/16/64	1430	WSMR	208	O.E. BERG	GSFC	
NEUTRAL PARTICLES	8.25GI	03/02/66	1759	WI	496	D. PELZ	GSFC	
PLASMAS	8.37GI	05/26/65	1901	WI	322	E.J. MAIER	GSFC	P
	14.213UI	09/01/65	1117	WI	150	W. HEIKKILA	SCAS	*
	14.214UI	09/03/65	0517	WI	153	W.J. HEIKKILA	SCAS	*P
	8.36GI	09/23/65	1436	WI	805	G.P. SERBU	GSFC	
	14.76UI	04/08/66	0401	WI	159	W. HEIKKILA	SCAS	
	8.38GI	10/06/66	2029	WI	650	R. BARRINGTON	DRTE	
POSITIVE IONS	10.74GI	12/21/61	2131	WI	100	J.A. KANE	GSFC	
	14.12GI	06/15/62	1648	WI	143	J.A. KANE	GSFC	*
	14.31GI	10/16/62	1506	WI	166	L.G. SMITH	GCA	*
	14.32GI	12/01/62	1806	WI	169	S.J. BAUER	GSFC	* P
	4.65GI	09/25/63	0709	WI	224	K. HIRAO	RRL	

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IONOSPHERIC PHYSICS	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
POSITIVE IONS	4.64GI	09/28/63	1443	WI	225	K. HIRAO	RRL	
	14.37GI	12/13/63	2232	WSMR	73	E.C. WHIPPLE	GSFC	P
	12.03GI	04/15/64	2325	WI	729	J.L. DONLEY	GSFC	
	14.33GI	06/03/64	1845	WI	139	S.J. BAUER	GSFC	*
	14.34GI	08/26/64	1601	WI	153	S.J. BAUER	GSFC	*
	8.24GI	10/19/64	1542	WI	840	K. HIRAO	RRL	
	8.19DI	11/05/64	2039	FC	840	H. ZANCANATA	BRL	
	8.20DI	11/07/64	0514	FC	715	H. ZANCANATA	BRL	
	8.37GI	05/26/65	1901	WI	322	F.J. MAIER	GSFC	P
	14.210GI	08/24/65	2159	WI	162	R.E. BOURDEAU	GSFC	*
	8.36GI	09/23/65	1436	WI	805	G.P. SERBU	GSFC	
	14.271UI	08/24/66	2315	WI	164	L.G. SMITH	GCA	* P
	14.272UI	08/25/66	0045	WI	169	L.G. SMITH	GCA	* P
	8.38GI	10/06/66	2029	WI	650	R. BARRINGTON	DRTE	
	10.181AI	10/25/66	1810	WSMR	119	E.C. WHIPPLE	ITSA	
	8.39GI	04/12/67	0522	FC	798	W.J. HEIKKILA	SCAS	
	8.38UI	12/08/67	0100	FC	805	W.B. HANSON	SCAS	*
R.F. IMPEDANCE	4.58UI	04/03/63	1646	WI	236	L.H. BORDEN	SRI	**
	4.59UI	07/10/63	0246	WI	212	L.H. BORDEN	SRI	*
	14.127GI	07/16/64	1622	WI	138	R.G. STONE	GSFC	*
STELLAR/SOLAR FLUXES	4.34	03/30/61	2150	WI	72	A. BOGGESS	GSFC	*
	14.210GI	08/24/65	2159	WI	162	R.E. BOURDEAU	GSFC	*
SYSTEMS TEST	16.02GT	10/21/64	1544	WI	1950	E.F. BORGNIT	GSFC	
	12.06GT	09/20/66	1705	WSMR	4	J.R. BUSSE	GSFC	
TOPSIDE SOUNDING	8.15AI	06/24/61	2317	WI	1018	S. RUSSELL	AIL	*
	8.17AI	10/14/61	0426	WI	1050	R.W. KNECHT	NBSB	*
	8.16AI	02/07/62	1150	WI	915	R.W. KNECHT	NBSB	P
	8.18GI	09/29/63	0237	WI	1038	J.L. DONLEY	GSFC	
	8.18GI	09/29/63	0237	WI	1038	J.L. DONLEY	GSFC	
ULTRAVIOLET	4.34	03/30/61	2150	WI	72	A. BOGGESS	GSFC	*
	14.66CI	02/27/63	1930	WI	151	L.G. SMITH	GCA	* P
	14.107GI	03/08/63	1930	WI	155	E.C. WHIPPLE	GSFC	* P

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IONOSPHERIC PHYSICS	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (LT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
ULTRAVIOLET	14.87CI	03/28/63	2006	WI	162	L.G. SMITH	GCA	*
	14.108GI	04/09/63	2028	WI	163	J.A. KANE	GSFC	*
	14.88CI	07/14/63	2103	FC	173	L.G. SMITH	GCA	
	14.91CI	07/20/63	2103	FC	198	L.G. SMITH	GCA	
	14.92CI	07/20/63	2113	FC	201	L.G. SMITH	GCA	
	14.94CI	07/20/63	2210	FC	193	L.G. SMITH	GCA	
	14.93CI	07/20/63	2140	FC	201	L.G. SMITH	GCA	P
	14.37GI	12/13/63	2232	WSMR	73	E.C. WHIPPLE	GSFC	P
	14.33GI	06/03/64	1845	WI	139	S.J. BAUER	GSFC	*
	14.34GI	08/26/64	1601	WI	153	S.J. BAUER	GSFC	*
	14.231UI	04/09/65	1918	CRO	N/A	S.A. BOWHILL	ILL	*
	14.210GI	08/24/65	2159	WI	162	R.E. BOURDEAU	GSFC	*
	14.68II	12/15/65	1919	NAT	185	L.J. BLUMLE	GSFC	
	14.69II	12/18/65	0459	NAT	188	L.J. BLUMLE	GSFC	
	14.303UI	11/12/66	1600	CAS	200	S.A. BOWHILL	ILL	
	14.304UI	11/12/66	1410	CAS	195	S.A. BOWHILL	ILL	
	14.274UI	11/12/66	1405	CAS	197	S.A. BOWHILL	ILL	
	14.302UI	11/12/66	1407	CAS	160	S.A. BOWHILL	ILL	
	14.275UI	01/31/67	1850	WI	195	S.A. BOWHILL	ILL	
	14.256II	03/16/67	1905	WI	141	E. SOMAYAJULU	INCO	P
WINDS, VAPOR RELEASE	14.267IA	03/13/67	0014	THU	155	P.D. BHAVSAR	AHMD	P
X RAYS	14.86CI	02/27/63	1930	WI	151	L.G. SMITH	GCA	* P
	14.107GI	03/08/63	1930	WI	155	E.C. WHIPPLE	GSFC	* P
	14.87CI	03/28/63	2006	WI	162	L.G. SMITH	GCA	*
	14.108GI	04/09/63	2028	WI	163	J.A. KANE	GSFC	*
	14.88CI	07/14/63	2103	FC	173	L.G. SMITH	GCA	
	14.91CI	07/20/63	2103	FC	198	L.G. SMITH	GCA	
	14.92CI	07/20/63	2113	FC	201	L.G. SMITH	GCA	
	14.93CI	07/20/63	2140	FC	201	L.G. SMITH	GCA	P
	14.94CI	07/20/63	2210	FC	193	L.G. SMITH	GCA	
	14.37GI	12/13/63	2232	WSMR	73	E.C. WHIPPLE	GSFC	P
	14.210GI	08/24/65	2159	WI	162	R.E. BOURDEAU	GSFC	*

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METEOROLOGY	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
AIRGLOW	4.156GM	08/29/66	1520	WSMR	206	D.F. HEATH	GSFC	* P
	18.62GM	01/22/68	0430	WI	296	D.F. HEATH	GSFC	P
ATMOSPHERIC DENSITY/COMP	10.128GM	07/23/65	1705	WI	116	W.S. SMITH	GSFC	* P
	10.174GM	10/19/65	2310	WI	114	W.S. SMITH	GSFC	*
	10.175GM	10/23/65	1614	WI	118	W.S. SMITH	GSFC	*
	10.176GM	10/28/65	0010	WI	116	W.S. SMITH	GSFC	*
	4.156GM	08/29/66	1520	WSMR	206	D.F. HEATH	GSFC	* P
	10.160GM	12/09/66	1100	WSMR	N/A	E. HILSENRATH	GSFC	
	10.161GM	05/11/67	0855	WI	70	E. HILSENRATH	GSFC	P
GRENADE	10.128GM	07/23/65	1705	WI	116	W.S. SMITH	GSFC	* P
	10.165GM	08/07/65	1945	FC	109	W.S. SMITH	GSFC	*
	10.96GM	08/07/65	1200	FC	130	W.S. SMITH	GSFC	
	10.151GM	08/07/65	1114	PB	120	W.S. SMITH	GSFC	*
	10.162GM	08/07/65	1940	PB	127	W.S. SMITH	GSFC	*
	10.168GM	08/07/65	2006	WI	120	W.S. SMITH	GSFC	*
	10.168GM	08/07/65	2006	WI	120	W.S. SMITH	GSFC	*
	10.166GM	08/08/65	0400	FC	116	W.S. SMITH	GSFC	*
	10.163GM	08/08/65	0415	PB	124	W.S. SMITH	GSFC	*
	10.167GM	08/08/65	1002	FC	119	W.S. SMITH	GSFC	*
	10.170GM	08/08/65	1015	WI	120	W.S. SMITH	GSFC	* P
	10.169GM	08/08/65	0340	WI	122	W.S. SMITH	GSFC	*
	10.164GM	08/09/65	1010	PB	124	W.S. SMITH	GSFC	*
	10.129GM	10/13/65	1651	WI	110	W.S. SMITH	GSFC	*
	10.152GM	10/13/65	1601	PB	N/A	W.S. SMITH	GSFC	*
	10.97GM	10/13/65	1612	FC	124	W.S. SMITH	GSFC	*
	10.177GM	10/19/65	1730	PB	N/A	W.S. SMITH	GSFC	* P
	10.174GM	10/19/65	2310	WI	114	W.S. SMITH	GSFC	*
	10.98GM	10/19/65	1730	FC	124	W.S. SMITH	GSFC	*
	10.175GM	10/23/65	1614	WI	118	W.S. SMITH	GSFC	*
	10.178GM	10/23/65	1538	PB	N/A	W.S. SMITH	GSFC	* P
	10.172GM	10/23/65	1638	FC	114	W.S. SMITH	GSFC	*
	10.179GM	10/27/65	2348	PB	N/A	W.S. SMITH	GSFC	*
	10.173GM	10/27/65	2348	FC	N/A	W.S. SMITH	GSFC	*

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METEOROLOGY	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (LT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
GRENADE	10.176GM	10/28/65	0010	WI	116	W.S. SMITH	GSFC	*
	10.185GM	01/23/66	0742	FC	125	W.S. SMITH	GSFC	
	10.147GM	02/01/66	2046	WI	118	W.S. SMITH	GSFC	
	10.182GM	02/01/66	2012	PB	117	W.S. SMITH	GSFC	P
	10.196GM	02/02/66	0202	FC	118	W.S. SMITH	GSFC	
	10.187GM	02/10/66	0709	FC	117	W.S. SMITH	GSFC	
	10.148GM	02/10/66	0748	WI	114	W.S. SMITH	GSFC	
	10.149GM	02/10/66	1841	WI	114	W.S. SMITH	GSFC	
	10.145GM	02/10/66	1800	FC	122	W.S. SMITH	GSFC	
	10.184GM	02/10/66	2130	PB	N/A	W.S. SMITH	GSFC	
	10.183GM	02/10/66	0800	PB	N/A	W.S. SMITH	GSFC	*
	10.180IM	03/24/66	1531	SON	135	G.V. GROVES	BNRC	P
	14.165IM	03/27/66	1712	SON	190	G.V. GROVES	GSFC	P
	14.249IM	04/26/66	0012	SON	190	G.V. GROVES	BNRC	P
	10.190GM	05/01/66	2210	PB	126	W.S. SMITH	GSFC	P
	10.194GM	05/02/66	0119	NAT	126	W.S. SMITH	GSFC	
	10.188GM	05/02/66	0114	WI	131	W.S. SMITH	GSFC	P
	10.195GM	05/02/66	0120	NAT	125	W.S. SMITH	GSFC	
	10.192GM	05/02/66	0232	FC	128	W.S. SMITH	GSFC	
	10.191GM	05/03/66	2201	PB	126	W.S. SMITH	GSFC	
	10.193GM	05/04/66	0008	FC	123	W.S. SMITH	GSFC	
	10.189GM	05/04/66	0037	WI	119	W.S. SMITH	GSFC	P
	10.196GM	06/17/66	0320	PB	N/A	W.S. SMITH	GSFC	
	10.198GM	06/17/66	0313	FC	N/A	W.S. SMITH	GSFC	
	10.197GM	06/23/66	0752	PB	N/A	W.S. SMITH	GSFC	
	10.199GM	06/23/66	0635	FC	N/A	W.S. SMITH	GSFC	
	14.256GM	08/07/66	0700	WI	114	W.S. SMITH	GSFC	P
	10.202GM	08/07/66	0904	FC	N/A	W.S. SMITH	GSFC	
	10.204GM	08/07/66	0705	NAT	N/A	W.S. SMITH	GSFC	
	10.203GM	08/07/66	1735	FC	N/A	W.S. SMITH	GSFC	
	10.206GM	08/07/66	2046	WI	N/A	W.S. SMITH	GSFC	
	10.205GM	08/07/66	2035	NAT	N/A	W.S. SMITH	GSFC	
	10.200GM	08/14/66	2035	PB	N/A	W.S. SMITH	GSFC	
	10.201GM	08/15/66	0808	PB	N/A	W.S. SMITH	GSFC	

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METEOROLOGY	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
GRENADE	10.146GM	09/30/66	1835	WI	118	W.S. SMITH	GSFC	
	14.217GM	09/30/66	2350	WI	153	W.S. SMITH	GSFC	
	10.211GM	10/01/66	0820	NAT	N/A	W.S. SMITH	GSFC	
	10.209GM	10/01/66	0530	WI	115	W.S. SMITH	GSFC	
	10.210GM	10/01/66	1127	WI	126	W.S. SMITH	GSFC	
	10.212GM	10/01/66	2035	NAT	N/A	W.S. SMITH	GSFC	
	10.213GM	10/02/66	0220	NAT	N/A	W.S. SMITH	GSFC	
	10.214GM	10/02/66	0820	NAT	N/A	W.S. SMITH	GSFC	
	10.215GM	10/02/66	1409	NAT	N/A	W.S. SMITH	GSFC	
	10.207GM	01/31/67	1911	WI	110	W.S. SMITH	GSFC	
	10.208GM	01/31/67	1719	WI	115	W.S. SMITH	GSFC	
	10.216GM	01/31/67	2348	PB	126	W.S. SMITH	GSFC	
	10.220GM	02/01/67	0956	PB	126	W.S. SMITH	GSFC	
	10.217GM	02/01/67	0141	PB	126	W.S. SMITH	GSFC	
	10.218GM	02/01/67	0418	PB	126	W.S. SMITH	GSFC	
	10.219GM	02/01/67	0704	PB	126	W.S. SMITH	GSFC	
	10.221GM	02/01/67	1426	PB	126	W.S. SMITH	GSFC	
	10.222GM	02/03/67	1752	WI	112	W.S. SMITH	GSFC	
	10.226GM	04/04/67	0010	PB	N/A	W.S. SMITH	GSFC	
	10.227GM	04/10/67	2100	PB	N/A	W.S. SMITH	GSFC	
	10.223GM	04/11/67	1715	WI	126	W.S. SMITH	GSFC	
	10.228GM	04/19/67	2208	PB	N/A	W.S. SMITH	GSFC	
	10.224GM	04/20/67	1732	WI	108	W.S. SMITH	GSFC	P
	10.225GM	04/29/67	1139	WI	123	W.S. SMITH	GSFC	
	10.229GM	04/30/67	0140	PB	N/A	W.S. SMITH	GSFC	
	10.232GM	05/04/67	2007	WI	115	W.S. SMITH	GSFC	
	10.230GM	05/09/67	0720	PB	N/A	W.S. SMITH	GSFC	
	10.233GM	05/11/67	0825	WI	129	W.S. SMITH	GSFC	P
	10.231GM	05/15/67	1140	PB	N/A	W.S. SMITH	GSFC	
	10.238GM	06/24/67	0826	NAT	N/A	W.S. SMITH	GSFC	
	10.237GM	06/24/67	2035	NAT	N/A	W.S. SMITH	GSFC	
	10.239GM	06/25/67	0834	NAT	N/A	W.S. SMITH	GSFC	
	10.248GM	10/14/67	1120	NAT	N/A	W.S. SMITH	GSFC	
	10.244GM	10/15/67	1115	NAT	N/A	W.S. SMITH	GSFC	

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METECROLOGY	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (LT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
GRENADE	10.245GM	10/15/67	2315	NAT	N/A	W.S. SMITH	GSFC	
	14.25CIM	11/29/67	0106	SCN	175	D. REES	UCL	
	14.250IM	11/29/67	C106	SCN	175	D. REES	UCL	
	1C.249GM	12/12/67	2200	WI	110	W.S. SMITH	GSFC	
	10.264GM	02/01/68	1853	WI	104	W.S. SMITH	GSFC	
IONOSPHERIC COMP/PROPAGT	15.32GM	10/24/67	1400	RES	N/A	J.A. KANE	GSFC	P
	15.33GM	10/24/67	1950	RES	N/A	J.A. KANE	GSFC	P
PITOT-STATIC TUBE	14.251UM	02/27/66	1657	AI	131	J.J. HORVATH	MICH	
	14.289UM	08/07/66	0949	FC	N/A	J.J. HORVATH	MICH	
	14.285UM	08/26/66	1911	WI	149	J.J. HORVATH	MICH	
	14.286UM	08/28/66	0423	WI	151	J.J. HORVATH	MICH	
ULTRAVICLET	4.156GM	08/25/66	1520	WSMR	206	D.F. HEATH	GSFC	* P
WEATHER (TEMP/PRESSURE)	10.128GM	07/23/65	1705	WI	116	W.S. SMITH	GSFC	* P
	10.168GM	08/07/65	2006	WI	120	W.S. SMITH	GSFC	*
	10.169GM	08/08/65	C340	WI	122	W.S. SMITH	GSFC	*
	1C.129GM	10/13/65	1651	WI	110	W.S. SMITH	GSFC	*
	10.174GM	10/19/65	2310	WI	114	W.S. SMITH	GSFC	*
	1C.175GM	10/23/65	1614	WI	118	W.S. SMITH	GSFC	*
	10.172GM	10/23/65	1638	FC	114	W.S. SMITH	GSFC	*
	10.173GM	10/27/65	2348	FC	N/A	W.S. SMITH	GSFC	*
	1C.176GM	10/28/65	C010	WI	116	W.S. SMITH	GSFC	*
	14.296GM	08/07/66	0700	WI	114	W.S. SMITH	GSFC	P
	14.319UM	01/31/67	2317	FC	127	J.J. HORVATH	MICH	
	14.317UM	02/01/67	0346	FC	162	J.J. HORVATH	MICH	
	14.318UM	02/01/67	C538	FC	164	J.J. HORVATH	MICH	
	14.316UM	02/01/67	0826	FC	159	J.J. HORVATH	MICH	
	14.322UM	02/01/67	1158	FC	152	J.J. HORVATH	MICH	
WINDS, VAPOR RELEASE	14.72CM	06/23/65	C103	WI	191	J.F. BEDINGER	GCA	*
	14.73CM	06/23/65	C847	WI	196	J.F. BEDINGER	GCA	*
	14.71CM	06/23/65	0159	WI	204	J.F. BEDINGER	GCA	*
	14.74CM	06/23/65	0852	WI	143	J.F. BEDINGER	GCA	*
	14.262CM	01/17/66	2239	WI	206	J.F. BEDINGER	GCA	
	14.265CM	01/18/66	C512	WI	207	J.F. BEDINGER	GCA	

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METEOROLOGY	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (GT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
WINDS, VAPOR RELEASE	14.263CM	01/18/66	0032	WI	205	J.F. BEDINGER	GCA	
	14.264CM	01/18/66	0200	WI	167	J.F. BEDINGER	GCA	
	14.266CM	01/18/66	1131	WI	213	J.F. BEDINGER	GCA	
	14.292CM	07/17/66	0500	WI	211	J.F. BEDINGER	GCA	*
	14.293CM	07/17/66	0645	WI	199	J.F. BEDINGER	GCA	*
	14.291CM	07/17/66	0056	WI	192	J.F. BEDINGER	GCA	*
	14.294CM	07/17/66	0825	WI	200	J.F. BEDINGER	GCA	*
	14.310CM	01/31/67	2320	FC	154	J.F. BEDINGER	GCA	
	14.312CM	02/01/67	0349	FC	154	J.F. BEDINGER	GCA	
	14.323CM	02/01/67	0829	FC	154	J.F. BEDINGER	GCA	
	14.311CM	02/01/67	0112	FC	154	J.F. BEDINGER	GCA	
	14.337CM	07/23/67	0053	WI	204	J.F. BEDINGER	GCA	
	14.338CM	08/09/67	0343	WI	214	J.F. BEDINGER	GCA	
	14.339CM	08/09/67	0847	WI	204	J.F. BEDINGER	GCA	
	14.340CM	08/09/67	0758	WI	211	J.F. BEDINGER	GCA	
	14.341GM	08/09/67	0928	WI	199	J.F. BEDINGER	GCA	
	14.342GM	08/09/67	0847	WI	158	J.F. BEDINGER	GCA	
	14.250IM	11/29/67	0106	SON	175	D. REES	UCL	
	14.367CM	02/22/68	0930	WI	190	W.S. SMITH	GSFC	
	14.365CM	02/22/68	0830	WI	175	W.S. SMITH	GSFC	
	14.366CM	02/22/68	0800	WI	181	W.S. SMITH	GSFC	
	14.250IM	11/29/67	0106	SON	175	D. REES	UCL	
SPECIAL PROJECTS								
AIRGLOW	1.13NP	09/06/62	1430	WSMR	74	C.A. BARTH	JPL	
CLOUD COVER	1.03GP	09/15/60	1809	FC	76	R.C. BAUMANN	GSFC	P
	1.05GP	09/24/60	1813	FC	76	R.C. BAUMANN	GSFC	P
	4.43GP	10/05/60	1952	FC	225	M.W. OLESON	NRL	
	1.04GP	05/17/61	1921	FC	77	H.E. EVANS	GSFC	* P
	1.06GP	05/19/61	1803	FC	73	H.E. EVANS	GSFC	*
	1.06GP	05/19/61	1803	FC	73	H.E. EVANS	GSFC	*
COMMUNICATIONS SYSTEMS	4.47NP	07/10/62	1500	WSMR	200	W.E. BROWN	JPL	

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SPECIAL PROJECTS	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (LT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
COMMUNICATIONS SYSTEMS	4.106NP	05/09/66	1520	WSMR	174	W.E. BROWN	JPL	
COSMIC RAYS	1.06GP	05/19/61	1803	FC	73	H.E. EVANS	GSFC	*
	4.13GP	09/26/64	1204	WI	120	J.R. BUSSE	GSFC	
GAMMA RAYS	4.13GP	09/26/64	1204	WI	120	J.R. BUSSE	GSFC	
ZERO GRAVITY	4.38NP	02/05/61	0848	WI	151	H. GOLD	LERC	
	4.39NP	04/21/61	0700	WI	154	H. GOLD	LERC	P
	4.42NP	08/12/61	1057	WI	153	H.W. PLOHR	LERC	P
	4.40NP	10/18/61	1325	WI	153	J. REGETZ	LERC	
	4.41NP	02/17/62	1943	WI	157	R.C. DILLON	LERC	
	4.26NP	06/20/62	1329	WI	157	R. FLAGE	LERC	
	4.27NP	11/17/62	0457	WI	207	E.L. CORPAS	LERC	
	4.28NP	06/19/63	1733	WI	191	E.L. CORPAS	LERC	P
	4.32NP	09/11/63	1424	WI	164	E.L. CORPAS	LERC	
MICROMETEORITES	4.67NP	06/10/64	1245	WSMR	154	W.H. KINARD	LARC	
SYSTEMS TEST	1.03GP	09/15/60	1809	FC	76	R.C. BAUMANN	GSFC	P
	1.05GP	09/24/60	1813	FC	76	R.C. BAUMANN	GSFC	P
	4.43GP	10/05/60	1952	FC	225	M.W. OLESON	NRL	
	1.06GP	05/19/61	1803	FC	73	H.E. EVANS	GSFC	*
TOPSIDE SOUNDING	4.105GP	06/30/65	1430	WSMR	158	F.T. BARATH	JPL	P
ULTRAVIOLET	1.13NP	09/06/62	1430	WSMR	74	C.A. BARTH	JPL	
WINDS, VAPOR RELEASE	4.13GP	09/26/64	1204	WI	120	J.R. BUSSE	GSFC	

* DATA AT NSSDC. ** DATA AT NSSDC, DESCRIPTION IN FOLLOWING SECTION. P INDICATES PARTIAL SUCCESS.

RADIO ASTRONOMY	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
COMMUNICATIONS SYSTEMS	8.33GR	10/23/64	1601	WI	1100	R.R. WEBER	GSFC	*
	8.44GR	05/20/66	1904	WI	918	R.G. STONE	GSFC	
ELECTRON DENSITY/TEMP	11.02UR	09/22/62	0645	WI	1703	F.T. HADDOCK	MICH	
	11.03UR	06/30/65	0533	WI	1770	W.J. LINDSAY	MICH	
	14.75GR	09/09/65	2358	WI	171	R.G. STONE	GSFC	*
R.F. IMPEDANCE	8.33GR	10/23/64	1601	WI	1100	R.R. WEBER	GSFC	*
	11.03UR	06/30/65	0533	WI	1770	W.J. LINDSAY	MICH	
	14.75GR	09/09/65	2358	WI	171	R.G. STONE	GSFC	*
	8.44GR	05/20/66	1904	WI	918	R.G. STONE	GSFC	
STELLAR/SOLAR SPECTRA	11.02UR	09/22/62	0645	WI	1703	F.T. HADDOCK	MICH	
SOLAR PHYSICS	11.03UR	06/30/65	0533	WI	1770	W.J. LINDSAY	MICH	
AIRGLOW	4.98US	05/07/63	1915	WI	223	W.G. FASTIE	JHU	**
	4.61AS	06/20/63	1425	WSMR	192	D.M. PACKER	NRL	P
	4.62AS	06/28/63	1430	WSMR	203	D.M. PACKER	NRL	P
COMMUNICATIONS SYSTEMS	16.05US	02/25/67	0235	WI	2380	R. HUGLENIN	HARV	P
ELECTRON DENSITY/TEMP	4.116GS	10/30/64	1930	WSMR	189	W.S. MUNSY	GSFC	
MICROMETEORITES	4.243DS	10/05/67	1430	WSMR	173	M.J. KOOMEN	NRL	
STELLAR/SOLAR FLUXES	4.25GS	09/30/61	1430	WI	224	W.E. BEHRING	GSFC	
	4.33GS	10/15/63	1605	WSMR	199	W.S. MUNSY	GSFC	P
	4.63GS	03/17/65	1510	WSMR	156	W.W. MUNEY	GSFC	
	4.49GS	04/12/65	1448	WSMR	200	K. FREDGA	GSFC	
	4.146DS	10/20/65	2035	WSMR	184	M.J. KOOMEN	NRL	P
	4.53GS	10/26/65	1525	WSMR	197	K. FREDGA	GSFC	
	4.145GS	12/02/65	1730	WSMR	185	K. FREDGA	GSFC	
	4.189DS	04/28/66	1235	WSMR	175	M.J. KOOMEN	NRL	
	4.191DS	11/12/66	1640	WSMR	174	M.J. KOOMEN	NRL	
	4.168CS	04/05/67	0015	WSMR	160	L. ACTON	LKHD	
	4.192DS	05/09/67	1618	WSMR	181	M.J. KOOMEN	NRL	

* DATA AT NSSDC. ** DATA AT NSSDC, DESCRIPTION IN FOLLOWING SECTION. P INDICATES PARTIAL SUCCESS.

SOLAR PHYSICS	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
STELLAR/SOLAR FLUXES	4.104DS	09/30/67	1614	WI	216	H.E. HINTEREGGER	CRL	
	4.152GS	10/03/67	1818	WI	184	J.H. UNDERWOOD	GSFC	
	4.239US	10/19/67	1805	WSMR	182	W.A. RENSE	COLO	
STELLAR/SOLAR PHOTOS	4.61AS	06/20/63	1425	WSMR	192	D.M. PACKER	NRL	P
	4.62AS	06/28/63	1430	WSMR	203	D.M. PACKER	NRL	P
	4.78GS	10/01/63	1700	WSMR	216	K.L. HALLAM	GSFC	
	4.33GS	10/15/63	1605	WSMR	199	W.S. MUNSY	GSFC	P
	4.49GS	04/12/65	1448	WSMR	200	K. FREDGA	GSFC	
	4.53GS	10/26/65	1525	WSMR	197	K. FREDGA	GSFC	
	4.145GS	12/02/65	1730	WSMR	185	K. FREDGA	GSFC	
	4.95GS	05/20/66	1510	WSMR	172	J.H. UNDERWOOD	GSFC	
	4.191DS	11/12/66	1640	WSMR	174	M.J. KOOMEN	NRL	
	4.192DS	05/09/67	1618	WSMR	181	M.J. KOOMEN	NRL	
	4.243DS	10/05/67	1430	WSMR	173	M.J. KOOMEN	NRL	
STELLAR/SOLAR SPECTRA	4.116GS	10/30/64	1930	WSMR	189	W.S. MUNSY	GSFC	
	4.63GS	03/17/65	1510	WSMR	156	W.W. MUNEY	GSFC	
	4.92GS	05/20/66	2330	WSMR	195	W.M. NEUPERT	GSFC	
	4.117GS	04/24/67	1520	WSMR	181	W.M. NEUPERT	GSFC	
	4.239US	10/19/67	1805	WSMR	182	W.A. RENSE	COLO	
SYSTEMS TEST	4.25GS	09/30/61	1430	WI	224	W.E. BEHRING	GSFC	
ULTRAVIOLET	4.23US	07/24/62	2141	WI	208	C.E. SHELDON	COLO	
	4.22US	09/06/63	2130	WSMR	222	L. GOLDBERG	HARV	
	4.78GS	10/01/63	1700	WSMR	216	K.L. HALLAM	GSFC	
	4.116GS	10/30/64	1930	WSMR	189	W.S. MUNSY	GSFC	
	4.49GS	04/12/65	1448	WSMR	200	K. FREDGA	GSFC	
	4.146DS	10/20/65	2035	WSMR	184	M.J. KOOMEN	NRL	P
	4.145GS	12/02/65	1730	WSMR	185	K. FREDGA	GSFC	
	4.99DS	03/02/66	1755	WI	229	H.E. HINTEREGGER	CRL	
	4.100DS	03/03/66	2154	WI	219	H.E. HINTEREGGER	CRL	P
	4.24US	04/14/66	1508	WSMR	192	R. PARKER	COLO	P
	4.189DS	04/28/66	1235	WSMR	175	M.J. KOOMEN	NRL	
	4.101DS	08/26/66	1813	WI	212	H.E. HINTEREGGER	CRL	

* DATA AT NSSDC. ** DATA AT NSSDC, DESCRIPTION IN FOLLOWING SECTION. P INDICATES PARTIAL SUCCESS.

SOLAR PHYSICS	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (UT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
ULTRAVIOLET	4.191DS	11/12/66	1640	WSMR	174	M.J. KOOMEN	NRL	
	4.102DS	03/14/67	1714	WI	205	H.E. HINTEREGGER	CRL	
	4.103DS	03/22/67	1656	WI	229	H.E. HINTEREGGER	CRL	
	4.192DS	05/09/67	1618	WSMR	181	M.J. KOOMEN	NRL	
	4.152GS	10/03/67	1818	WI	184	J.H. UNDERWOOD	GSFC	
	4.239US	10/19/67	1805	WSMR	182	W.A. RENSE	COLO	
X RAYS	4.25GS	09/30/61	1430	WI	224	W.E. BEHRING	GSFC	
	4.33GS	10/15/63	1605	WSMR	199	W.S. MUNSY	GSFC	P
	4.116GS	10/30/64	1930	WSMR	189	W.S. MUNSY	GSFC	
	4.63GS	03/17/65	1510	WSMR	156	W.W. MUNEY	GSFC	
	4.189DS	04/28/66	1235	WSMR	175	M.J. KOOMEN	NRL	
	4.92GS	05/20/66	2330	WSMR	195	W.M. NEUPERT	GSFC	
	4.95GS	05/20/66	1510	WSMR	172	J.H. UNDERWOOD	GSFC	
	17.02GS	08/17/66	1950	WI	358	D.G. CARTWRIGHT	MINN	
	4.153GS	11/12/66	1615	WSMR	151	J.H. UNDERWOOD	GSFC	
	4.168CS	04/05/67	0015	WSMR	160	L. ACTON	LKHD	
	4.152GS	10/03/67	1818	WI	184	J.H. UNDERWOOD	GSFC	
	4.195CS	02/19/68	2315	WSMR	161	L. ACTON	LKHD	
TEST AND SUPPORT								
ALBEDO	4.60GT	08/08/62	1655	WI	150	A. BOGGESS	GSFC	P
COSMIC RAYS	4.48GT	05/25/62	1243	WI	200	O.E. BERG	GSFC	P
ELECTRON DENSITY/TEMP	4.48GT	05/25/62	1243	WI	200	O.E. BERG	GSFC	P
IONOSPHERIC COMP/PROPAGT	17.02GT	08/17/66	1950	WI	358	D.G. CARTWRIGHT	MINN	*
MICROMETEORITES	4.12GT	03/25/60	1840	WI	248	E.F. SORGNIT	GSFC	P
	4.48GT	05/25/62	1243	WI	200	O.E. BERG	GSFC	
	14.343GT	08/05/67	0159	WSMR	150	C.L. HEMENWAY	DUDL	P
STELLAR/SOLAR FLUXES	4.60GT	08/08/62	1655	WI	150	A. BOGGESS	GSFC	P
STELLAR/SOLAR SPECTRA	4.60GT	08/08/62	1655	WI	150	A. BOGGESS	GSFC	P

* DATA AT NSSDC, ** DATA AT NSSDC, DESCRIPTION IN FOLLOWING SECTION. P INDICATES PARTIAL SUCCESS.

TEST AND SUPPORT	ROCKET NUMBER	LAUNCH DATE	LAUNCH TIME (LT)	LAUNCH SITE	PEAK ALTITUDE (KM)	EXPERIMENTER	ORGANIZATION	
SYSTEMS TEST	4.12GT	03/25/60	1840	WI	248	F.F. SORGNIT	GSFC	P
	4.68GT	01/13/62	1615	WI	209	K.R. FROST	GSFC	
	4.10GT	04/23/60	2144	WI	246	K. MEDROW	GSFC	
	5.01GT	07/22/60	0705	WI	225	E.F. SORGNIT	GSFC	
	3.28GT	08/09/60	2010	WI	25	E.F. SORGNIT	GSFC	
	5.02GT	10/18/60	1417	WI	225	E.F. SORGNIT	GSFC	
	3.29GT	11/03/60	1619	WI	193	E.F. SORGNIT	GSFC	
	3.36GT	01/17/61	0425	WI	208	E.F. SORGNIT	GSFC	
	5.03GT	01/19/61	1242	WI	139	E.F. SORGNIT	GSFC	P
	10.49GT	03/15/61	1747	WI	128	D.W. DAMEROW	GSFC	
	12.01GT	05/02/61	2115	WI	14	N.W. SPENCER	MICH	
	14.01GI	05/25/61	1703	WI	192	E.F. SORGNIT	GSFC	*
	8.09GT	06/13/61	0012	WI	867	S.J. BAUER	REL	P
	14.02GT	08/16/61	2027	WI	206	E.F. SORGNIT	GSFC	*
	4.68GT	01/13/62	1615	WI	209	K.R. FROST	GSFC	*
	10.69GT	03/01/62	2330	WI	22	B.D. DONN	GSFC	P
	10.70GT	03/02/62	1047	WI	143	B.D. DONN	GSFC	
	16.01GT	04/08/63	1126	WI	76	E.F. SORGNIT	GSFC	
	4.87GT	06/17/63	1800	WSMR	182	W.A. RUSSELL	GSFC	
	14.111GT	10/31/63	2117	WI	134	L. WILLIAMS	GSFC	*
	4.88GT	01/28/64	1900	WSMR	188	W.A. RUSSELL	GSFC	
	14.28GT	02/12/64	2030	WI	145	E. SORGNIT	LARC	*
	12.03GT	04/15/64	2325	WI	729	J.L. DONLEY	GSFC	
	4.13GT	09/26/64	1204	WI	120	J.R. BUSSE	GSFC	
	12.02GT	12/11/64	1800	WI	2	F.W. COLLINS	GSFC	
	17.01GT	06/18/65	2311	WI	374	J.H. LANE	GSFC	
	17.02GT	08/17/66	1950	WI	358	D.G. CARTWRIGHT	MINN	*
	15.55GT	05/20/67	2035	WI	47	J.R. LEASE	GSFC	
	14.343GT	08/05/67	0159	WSMR	150	C.L. HEMENWAY	DUDL	P
	4.201NT	12/10/67	2200	WSMR	160	Q.M. HANSEN	ARC	P
* RAYS ERROR IN DATE/TIME IN FOLLOWING RECORD	4.172UG	08/04/67	0453	WSMR	130	A.D. CODE	WISC	

C. Rocket Data Descriptions

AIRGLOW MEASUREMENTS IN THE FAR ULTRAVIOLET

Investigators:

W. G. Fastie–Johns Hopkins University
H. M. Crosswhite–Johns Hopkins University
D. F. Heath–Johns Hopkins University

NASA Aerobee 150A

	4.71 UA	4.72 UA	4.98 UA
Day of Launch	June 29, 1962	June 29, 1962	May 7, 1963
Time of Launch	0455 UT	2100 UT	1900 UT
Peak Altitude	209.5 km	210 km	223 km
Launch Site	WI	WI	WI

Each rocket carried a far ultraviolet scanning grating spectrophotometer covering the wavelength range from 1100 to 2000 A. The detectors for 4.71 UA and 4.72 UA were blue-sensitive photomultiplier tubes, with sodium salicylate powder films deposited on the window. These detectors were limited by low quantum efficiency and sensitivity to long wavelength light. The detector for 4.98 UA employed a CsI photosurface on a LiF window. The photon efficiency was thus much improved, and the high work function of CsI resulted in very low dark current noise and insensitivity to scattered long wavelength radiation. Three filtered photometers, sensitive to the 6300-A wavelength and to the 1500- to 3000-A region, were mounted to look in the forward direction along the rocket axis.

Data include:

1. Time variation of 1216 Lyman-alpha and 1304 O-I* lines for 4.72 UA and 4.98 UA with a time variation of 1356 O-I* for 4.98 UA
2. Altitude profiles of 1217 Lyman-alpha for all three flights
3. Altitude profiles of 1304 O-I* for 4.72 UA and altitude profiles of 1304 and 1356 O-I* for 4.98 UA
4. Altitude profile of 1200 N-I** for 4.98 UA

AURORAL PARAMETERS EXPERIMENTS***

Air Force Rockets

	AC3.603	AD3.612	AE3.613
Day of Launch	February 9, 1964	March 13, 1965	March 6, 1965
Time of Launch	0411 UT	0742 UT	0731 UT
Peak Altitude	228 km	185 km	193 km
Launch Site	FC	FC	FC

*Neutral oxygen.
**Neutral nitrogen.
***A partial listing of the many contributors is contained in: Baker, K. D., "Direct In Situ Measurements of Auroral Parameters," AFCRL Report 66-413, May 1966.

Two rockets (AC3.603 and AE3.613) were launched into relatively dim, diffuse (IBC I) auroras, and the third (AD3.612) was fired through several segments of an active, medium-intensity (IBC II) aurora. The instrumentation of these rocket payloads included electrostatic analyzers and a soft electron spectrometer for measurement of the electron energy spectrum from 40 to 60 000 ev; scintillators for auroral particle energy deposition (electrons E $>$ 6 kev, protons E $>$ 60 kev); Geiger counters for X rays (1-12 A) and electrons (E $>$ 40 kev); RF impedance probes for electron density and temperature; retarding potential analyzers for electron and positive ion densities and temperatures; a mass spectrometer for positive ion composition; and photometers for auroral light measurements. Two magnetic aspect sensors were included, one parallel and one transverse to the rocket's longitudinal axis. In addition to the on-board rocket measurements, ground-based instruments provided correlating measurements; these instruments included all-sky cameras, photometers, spectrometers, magnetometers, riometers, and a vertical ionosonde.

Data include:

1. Flight trajectories
2. The results of the ground-based measurements
3. Measurements of fluctuations in the earth's magnetic field
4. Electron density from the standing wave impedance probes (AC3.603, AD3.612, AE3.613), and from the plasma frequency probes (AC3.603, AD3.612), and from the retarding potential analyzer (AD3.612)
5. Positive ion currents from the retarding potential analyzers
6. Retarding potential analyzer data taken at 100 km for the ion detector (AC3.603)
7. Vehicle potential (volts) measured by the retarding potential analyzer near apogee (AC3.603, AE3.613)
8. Electron temperature vs altitude and time of flight as measured by the RF electron temperature probe, the retarding potential analyzer as a Langmuir probe, and by the plasma frequency probe (AC3.603), and also as determined by the retarding slope method of the retarding potential analyzer (AD3.612, AE3.613)
9. Auroral light measured by photometers which had a 9° field of view in a direction normal to the longitudinal rocket axis (AD3.612, AE3.613)
10. Count rate of GM tube (1.4 mg/cm^2 window) (AD3.612, AE3.613)
11. Scintillator data from ejected package (AE3.613)

DIFFERENTIAL ABSORPTION AND FARADAY ROTATION EXPERIMENTS

NASA Nike Apache

Investigators:

S. A. Bowhill–University of Illinois
L. G. Smith–Geophysics Corporation of America

The rockets launched were part of a program to study and D and E regions of the ionosphere by measurements of electron density. The techniques used were differential absorption and Faraday rotation.

Data include:

1. Plots of extraordinary power vs time after launch for each rocket
2. Plots of Faraday rotation vs time after launch for each rocket

SOUNDING ROCKET DATA

Launch Date			Launch Time (UT)	Peak Altitude (km)	Launch Site	Rocket Number
Mo	Da	Yr				
04	16	64	2105	169	WI	14.143UI
07	15	64	0800	155.3	WI	14.144UI
07	15	64	0920	159.8	WI	14.145UI
07	15	64	1025	170.7	WI	14.146UI
11	10	64	1107	117	WI	14.147UI
11	19	64	2202	169.4	SHIP	14.148UI
11	19	64	2020	165	WI	14.149UI
03	20	65	1320	174	SHIP	14.228UI
04	05	65	1345	177	SHIP	14.230UI
04	09	65	1918	191	SHIP	14.231UI
04	12	65	1714	186	SHIP	14.232UI
06	14	65	0913	176	WI	14.245UI
06	17	65	2141	176	WI	14.246UI
09	15	65	2028	180	WI	14.244UI
12	15	65	1700	182	WI	14.247UI
01	10	66	1714	186	WI	14.248UI

ENERGETIC ELECTRON PRECIPITATION EXPERIMENT

NASA Nike Apache (14.118 GE)

Day of Launch: March 24, 1964
Time of Launch: 0422:54 (UT)
Peak Altitude: 184 km
Launch Site: FC

Investigator:
D. S. Evans–Goddard Space Flight Center

The rocket was launched into a diffuse, post-breakup auroral display. A zinc sulfide scintillation counter having a maximum and constant sensitivity for electrons between 8 and 60 kev measured the total auroral particle energy influx. It viewed the incident charged particle flux through a collimator having a geometrical factor of 0.095 cm^2 ster. Three channel multiplier electron detectors were set up, by means of collimators and magnets, to measure electrons in the ranges 2.5 to 6 kev, 7 to 16 kev, and 18 to 35 kev. The scintillation counter as well as collimator axes were directed at an angle of 45° to the rocket spin axis. A fourth channel multiplier unit in a shielded configuration measured the background. A fluxgate magnetometer in the payload provided information about the orientation of the particle detectors with respect to the magnetic field.

Data include:

1. Flight description
2. A schematic of the channel multiplier-magnetic analyzer electron detector
3. The response curve of the channel multiplier-magnetic analyzer as a function of energy
4. Fourteen-second auroral all-sky photographs taken at 21 sec and 156 sec after launch
5. The raw responses of all detectors plotted against flight time
6. Sample electron differential electron energy spectra obtained during the flight
7. The details of the intensity rise at +156 sec as detected by the 3.5-kev, 25-kev, and total energy detectors

GRENADE EXPERIMENTS

Nike Cajun Rockets

Investigators:

W. S. Smith–Goddard Space Flight Center
W. Nordberg–Goddard Space Flight Center
J. Theon–Goddard Space Flight Center
J. F. Bedinger–Geophysics Corporation of America
E. Manring–Air Force Cambridge Research Laboratories
L. H. Brace–Goddard Space Flight Center
J. J. Horvath–University of Michigan

The grenade experiments listed below were designed to obtain temperature, wind, density, and pressure data between 30 and 120 km by exploding a series of grenades during ascent of the rocket and recording time and direction of sound intervals on an array of sensitive microphones on the ground.

The directly measured parameters of temperature and wind are tabulated in computer printout form, as are tables of interpolated temperature, computed pressure, percent pressure deviation from the 1962 U.S. standard atmosphere, computed density, and percent density deviation from the standard atmosphere as a function of height. The winds at 5-km intervals are tabulated in component form; these components are linear interpolations of the measured winds. The individual errors in the measured winds and temperatures are also tabulated.

Data are available for 62 grenade experiments flown aboard Nike Cajun rockets during the period of July 9, 1960, to February 10, 1966:

GRENADE DATA

Launch Date			Launch Time (UT)	Peak Altitude (km)	Launch Site	Rocket Number
Mo	Da	Yr				
07	09	60	0359	103.5	WI	10.04GA
02	14	61	2350	130	WI	10.07GA
02	17	61	0226	84	WI	10.08GA
04	05	61	1257	114	WI	10.33GA
05	05	61	2300	112	WI	10.02GA
05	06	61	0454	114	WI	10.28GA
07	13	61	2207	118	WI	10.30GA
07	14	61	1602	101	WI	10.31GA

GRENADE DATA (Continued)

Launch Date			Launch Time (UT)	Peak Altitude (km)	Launch Site	Rocket Number
Mo	Da	Yr				
07	20	61	1030	128	WI	10.32GA
09	16	61	2355	88.5	WI	10.36GA
03	02	62	0005	112.4	WI	10.38GA
03	02	62	1115	114	WI	10.39GA
03	23	62	2354	121	WI	10.40GA
03	28	62	0004	122	WI	10.41GA
04	17	62	0928	118	WI	10.42GA
06	07	62	0005	120	WI	10.43GA
06	08	62	0053	117.3	WI	10.44GA
12	01	62	2125	124.2	WI	10.45GA
12	04	62	0719	51	WI	10.46GA
12	06	62	0532	118.6	WI	10.47GA
12	06	62	0543	113.7	FC	10.66GA
02	20	63	2334	112.7	FC	10.58GA
02	20	63	2347	112.4	WI	10.48GA
02	28	63	2148	112.7	FC	10.59GA
02	28	63	2211	102.7	WI	10.53GA
03	09	63	0001	117	FC	10.60GA
03	09	63	0001	112	WI	10.54GA
12	07	63	1312	104	WI	10.55GA
01	24	64	0016	128.0	WI	10.61GA
01	29	64	0411	114.1	WI	10.71GA
01	29	64	0417	123.0	FC	10.89GA
01	29	64	0418	124.0	AI	10.81GA
02	04	64	0146	115.8	WI	10.62GA
02	05	64	0040	125.0	FC	10.87GA
02	05	64	0320	119.0	WI	10.63GA
02	13	64	0430	119.0	FC	10.88GA
02	13	64	0430	118.9	WI	10.136GA
02	13	64	0455	122.0	AI	10.82GA
03	07	64	0245	114.1	WI	10.137GA
04	18	64	0039	127.2	FC	10.73GA
04	18	64	0059	126.0	WI	10.83GA
08	07	64	0100	118.0	WI	10.78GA
08	08	64	0400	139.2	FC	10.104GA
08	12	64	0149	115.9	WI	10.84GA
08	12	64	0215	124.8	FC	10.105GA
08	16	64	0315	122.0	WI	10.85GA
08	16	64	0553	124.0	AI	10.115GA
08	17	64	1255	122.0	AI	10.116GA
08	18	64	0115	124.8	FC	10.106GA
08	18	64	0125	120.2	WI	10.113GA
11	05	64	1700	123.2	WI	10.107GA
11	06	64	0002	120.3	WI	10.133GA
11	06	64	0520	120.8	WI	10.134GA

GRENADE DATA (Continued)

Launch Date			Launch Time (UT)	Peak Altitude (km)	Launch Site	Rocket Number
Mo	Da	Yr				
11	06	64	1000	125.0	WI	10.135GA
11	19	64	1902	125.0	WI	10.117GA
08	07	65	2006	120.3	WI	10.168GM
08	08	65	0340	121.9	WI	10.169GM
10	13	65	1612	124.4	FC	10.97GM
10	19	65	1730	123.5	FC	10.98GM
10	23	65	1638	114.4	FC	10.172GM
10	27	65	2348	N/A	FC	10.173GM
02	10	66	0800	N/A	PB	10.183GM

ION MASS SPECTROMETER EXPERIMENT

Investigators:

H. A. Taylor–Goddard Space Flight Center
H. C. Brinton–Goddard Space Flight Center

NASA Aerobee 150A (4.14 GA)

Day of Launch: November 15, 1960
Time of Launch: 1641 UT
Peak Altitude: 230 km
Launch Site: WI

The rocket was fired into the ionosphere during the calming stage immediately after a period of moderate disturbance. Positive ion constituents were measured using a Bennett radio frequency mass spectrometer, which was mounted perpendicular to the rocket axis. The positive ion spectrum was sampled over the range of 8 to 46 amu once every 1.3 sec. Spectrometer sensitivity was modified by varying the stopping potential in six steps so that spectra at equal sensitivity were recorded at approximately 8-sec intervals.

Reference: Taylor, H. A., Jr., and H. C. Brinton, "Atmospheric Ion Composition Measured above Wallops Island, Virginia," *J. Geophys. Res., 66,* 2587–2588, Aug. 1961.

The data, which have all been published in the reference, include a graph of altitude vs composition in percent for primary constituents.

LOW-ENERGY AURORAL ELECTRONS EXPERIMENTS

Investigator:

D. S. Evans–Goddard Space Flight Center

NASA Nike Apache

	14.188 GE	14.189 GE
Day of Launch	February 10, 1966	February 19, 1966
Time of Launch	0551 UT	0556 UT
Peak Altitude	202 km	201 km
Launch Site	FC	FC

A zinc sulfide powder scintillator detector measured the integrated energy flux above a 4-kev threshold which was set by an aluminum covering used to suppress light. Both rockets carried channel electron multiplier detectors in a magnetic spectrometer configuration. Six such detectors were included in each payload with center energies E_0 nominally at 1, 2, 4, 8, 16, and 32 kev. A seventh detector was used to pick up background radiation. Rocket 14.188 GE was launched into a rather structured and active auroral form; whereas 14.189 GE was launched into a moderately active breakup phase.

Electrons having energies greater than 50 kev were detected using a plastic scintillator-phototube detector. An electron integral energy spectrum was obtained by feeding the phototube pulses to a three-channel threshold discriminator. The thresholds were nominally set to pulses corresponding to energy losses in the scintillator of 60, 120, and 250 kev. An aluminum covering over the plastic scintillator suppressed the effect of auroral light on the detector response. A photomultiplier tube coupled to an optical interference filter, having a broad transmission band centered about 3914 A, provided a rough measure of the auroral brightness. All these detectors were mounted such that their fields of view were co-aligned at an angle of 45° to the rocket spin axis. The rocket spin rate and aspect were provided by a fluxgate magnetometer.

Data include:

1. One-sec averaged response of the 4-kev electron detector during the flight of 14.188
2. Sample electron differential energy spectra observed on flight 14.188
3. The relative responses of the low-energy electron detectors during reentry of 14.188 as plotted against atmospheric depth
4. One-sec averaged responses of the 4-kev and 60-kev electron detectors during the flight of 14.189
5. Sample electron differential energy spectra observed on flight 14.189 at pitch angles of 45° and 135°
6. The relative responses of the low-energy electron detectors during reentry of 14.189 plotted against atmospheric depth

NEUTRAL MASS SPECTROMETER EXPERIMENT

Investigators:

E. Meadows-Reed–Goddard Space Flight Center
C. R. Smith–Goddard Space Flight Center

NASA Aerobee 150A (4.14 GA)

Day of Launch: November 15, 1960
Time of Launch: 1641 UT
Peak Altitude: 230 km
Launch Site: WI

Neutral particle constituents were measured using a Bennett radio frequency mass spectrometer, which was mounted parallel to the rocket axis at the forward end. The spectrometer had a 7-5 cycle three-stage analyzer with a resolution of about 1 part in 25. The mass range of 8 to 48 amu was swept once every 1.4 sec. The ion source used 45-volt electrons at a nominal current of 10 ma.

Reference: Meadows-Reed, E., and C. R. Smith, "Mass Spectrometric Investigations of the Atmosphere between 100 and 227 Kilometers above Wallops Island, Virginia," *J. Geophys. Res., 69,* 3199–3207, Aug. 1964.

The data, which have all been published in the reference, include:

1. Table of altitude, total velocity, time, and angle of attack for ascent and descent

2. Graphs of ion current (amperes vs time (sec) and altitude above sea level (km) for various amu (measured))

3. Graph of separation ratio vs altitude above sea level

NEUTRON PROPORTIONAL COUNTER EXPERIMENT

Investigators:
W. P. Reidy–Geophysics Corporation of America
R. C. Haymes*–New York University
S. A. Korff–New York University

NASA Aerobee 150A (4.16 UE)

Day of Launch: August 23, 1960
Time of Launch: 1701 UT
Peak Altitude: 200 km
Launch Site: WI

NASA 4.16 UE was launched on a geomagnetically quiet day. The rocket contained 44 boron trifluoride proportional counters, 20 containing 96% B^{10} and 24 containing 10% B^{10}. The slightly modified Anton type 805 counters were filled to a pressure of 55 cm of Hg. The active length was 20.3 cm; the inside diameter was 2.2 cm; and the aluminum wall was 1.6 mm thick. The boron trifluoride counters detected slow neutrons by the reaction B^{10} (n, α) Li^7. The products of this reaction lost their energy primarily by ionization in the counter. Thus, the counting rate due to neutrons and the background due to highly ionizing events could be determined.

Reference: Reidy, W. P., R. C. Haymes, and S. A. Korff, "A Measurement of Slow Cosmic-Ray Neutrons up to 200 Kilometers," *J. Geophys. Res., 67,* 459-465, Feb. 1962.

*Now at Rice University.

The data, which have all been published in the reference, include:

1. Individual counting rates for the two groups of counters as a function of altitude, averaged over 20-sec intervals

2. Slow neutron and background counting rates for the flight, averaged over 40-sec intervals

PITOT-STATIC TUBE EXPERIMENTS

Investigator:
J. J. Horvath–University of Michigan

Nike Apache

	4.58 UI	4.59 UI
Day of Launch	April 3, 1963	July 10, 1963
Time of Launch	1646 UT	0246 UT
Peak Altitude	236 km	212 km
Launch Site	WI	WI

The pitot-static tube experiments were designed to measure pressure, temperature, and density in the region of 30 to 120 km. Two radioactive ionization pressure gages were installed in each payload so that density and ambient pressure could be measured as the Nike Apache rocket ascended. The gage outputs were telemetered to ground-based receiving and recording equipment.

The pitot-tube data are presented as measured pressure and density and derived temperature. The pressure and density deviations from the 1962 U. S. standard atmosphere are tabulated with the measured data.

PITOT-STATIC TUBE DATA

Launch Date			Launch Time (UT)	Peak Altitude (km)	Launch Site	Rocket Number
Mo	Da	Yr				
02	04	64	0135	158	AI	14.22UA
04	15	64	0122	156	AI	14.24UA
04	15	64	1556	158	AI	14.23UA

VLF PROPAGATION AND NOISE IN THE IONOSPHERE EXPERIMENTS

Investigators:
L. H. Rorden–Stanford University
L. E. Orsak–Stanford University
M. E. Mills–Stanford University

The fundamental purpose of the following experiments was to explore the effects of the lower ionosphere on VLF waves.

Experiments on Aerobee 4.58 UI	Experiments on Aerobee 4.59 UI
Band 1 Receiver (0.2–1.6 kHz)	Band 1 Receiver (0.2–1.6 kHz)
Band 2 Receiver (1.6–12.5 kHz)	Band 2 Receiver (1.6–12.5 kHz)
Band 3 Receiver (12.5–100 kHz)	Band 3 Receiver (12.5–100 kHz)
Band 4 Receiver (1.25–1.6 MHz)	Band 4 Receiver (1.25–1.6 MHz)
Broadband Receiver (0.2–12.5 kHz)	Broadband Receiver (0.2–12.5 kHz)
NSS Receiver (22.3 kHz)	NSS Receiver (22.3 kHz)
Impedance Probe (1.54 and 120 kHz)–failed	Impedance Probe (1.54 and 120 kHz)
Magnetometer (spin coil)	Magnetometer (spin coil)
Chamber Pressure	Chamber Pressure
Sun-Earth Aspect	Moon Aspect
Temperature and Voltage	Conductance Probe
Linear Accelerometer	Lateral Accelerometers (2)

The receivers for bands 1, 2, and 3 shared a low frequency vertical loop antenna, while the band 4 receiver used an independent vertical loop antenna. The broadband receivers derived their input signal from the output of the low-pass filter of the band 2 sweeping receiver. The NSS receivers, each consisting of three receivers, operated on signals from the low frequency vertical loop antenna, a horizontal loop antenna, and the electric plate antenna. The impedance probe consisted of oscillators and a copper strip electric dipole that was mounted on the satellite nose cone; it measured the complex impedance of the electric dipole. The magnetometers, utilizing the same loop antenna as the low frequency receivers, measured the component of the earth's magnetic field in the direction perpendicular to the rocket axis. Aerobee 4.58 carried a conductance probe which was a thin cylinder on the rocket axis extending 60 cm beyond the normal nose tip.

The data include:

1. Aerobee 4.58 UI and 4.59 UI flight trajectory
2. Aerobee 4.58 UI and 4.59 UI bands 1, 2, 3, and 4 data for ascent and descent
3. Magnetic flux density measured by both rockets for ascent and descent
4. Aerobee 4.58 UI and 4.59 UI broadband receiver spectral and amplitude data for ascent and descent
5. Aerobee 4.59 UI low frequency impedance probe conductance and capacitance data for ascent and descent
6. Aerobee 4.59 UI high frequency impedance probe capacitance data for ascent and descent
7. Conductance and capacitance as a function of height for ascent and descent in the sporadic E ionization layer as measured by Aerobee 4.59 UI
8. Aerobee 4.58 UI and 4.59 UI electron density profile for ascent and descent
9. Aerobee 4.59 UI measured probe conductance vs bias for 200-km altitude
10. Aerobee 4.58 UI payload temperature data

PART VI. SATELLITE ORBIT AND EPHEMERIS INFORMATION

Satellite orbit and ephemeris information are available in the form of satellite maps generated from a computer program that determines subsatellite points at specified (generally 1-min) time intervals of the satellite's orbit. The subsatellite point consists of geodetic longitude between ±180°, geodetic latitude between ±90°, and height above sea level in kilometers. In addition to the subsatellite points, the program computes ascending node crossings for each pass. Other parameters – such as gyrofrequency, magnetic field dip angle, solar zenith angle, and geomagnetic latitude at the satellite – are computed for several of the satellites, depending upon the usefulness of these parameters in conjunction with the spacecraft's experimental data.

The satellite maps listed below are available on 100-ft reels of microfilm with approximately 10 weeks of information on each reel.

WORLD MAP INVENTORY

Satellite Name	International Designation	Period					
		Start			End		
		Mo	Da	Yr	Mo	Da	Yr
Alouette 1	1962 Beta Alpha 1	09	29	62	10	08	67
Alouette 2	1965 98A	11	29	65	03	20	66
		05	29	66	08	27	67
Anna 1B	1962 Beta Mu 1	10	31	62	11	12	62
Ariel 1	1962 Omicron 1	04	26	62	12	09	63
		12	30	63	07	14	64
		08	25	64	11	10	64
		06	28	65	10	05	65
Ariel 2	1964 15A	03	27	64	04	10	64
		04	14	64	09	21	64
		09	26	64	01	18	66
		03	01	66	05	30	66
Ariel 3	1967 42A	05	05	67	11	21	67
Atlas-Centaur 4	1964 82A	12	11	64	12	12	64
ATS 2	1967 31A	04	06	67	08	22	67
Cosmos 2	1962 Iota 1	04	07	62	04	12	62
Courier 1B	1960 Nu 1	10	30	60	09	03	61
		09	10	61	10	29	61
		11	06	61	11	27	61

WORLD MAP INVENTORY (Continued)

Satellite Name	International Designation	Period					
		Start			End		
		Mo	Da	Yr	Mo	Da	Yr
Echo 1	1960 Iota 1	02	19	61	04	16	61
		10	29	61	07	09	62
		07	16	62	11	19	62
		11	26	62	03	18	63
		03	25	63	11	15	63
		11	18	63	07	27	65
		08	02	65	01	11	66
		01	17	66	02	08	66
Echo 2	1964 4A	01	25	64	10	18	64
		10	25	64	10	31	67
EGRS 1	1964 1C	01	11	64	07	20	65
		08	03	65	09	28	65
EGRS 2	1966 77B	11	01	66	01	16	68
ERS 15	1966 77C	08	19	66	01	02	68
ERS 16	1966 51C	06	20	66	02	22	67
ERS 17	1965 58C	07	20	65	01	04	66
ERS 18	1967 40C	04	28	67	11	03	67
ESSA 1	1966 8A	02	03	66	08	23	66
		11	07	66	08	15	67
ESSA 2	1966 16A	05	03	66	01	16	68
ESSA 3	1966 87A	10	02	66	01	16	68
ESSA 4	1967 6A	01	26	67	12	25	67
ESSA 5	1967 36A	04	20	67	12	19	67
Explorer 6	1959 Delta 1	08	07	59	10	06	59
Explorer 7	1959 Iota 1	10	13	59	04	15	60
		01	01	61	01	08	62
Explorer 8	1960 Xi 1	11	03	60	12	25	60
Explorer 9	1961 Delta 1	02	16	61	03	12	61
Explorer 11	1961 Nu 1	04	27	61	12	25	61
Explorer 12	1961 Upsilon 1	08	15	61	12	18	61
		01	06	62	01	29	62
Explorer 14	1962 Beta Gamma 1	10	02	62	03	03	64
Explorer 15	1962 Beta Lambda 1	10	26	62	02	17	63
		02	25	63	06	25	63
Explorer 16	1962 Beta Chi 1	12	16	62	09	09	63
Explorer 17	1963 9A	05	28	63	07	23	63
		07	29	63	08	13	63
Explorer 18	1963 46A	11	27	63	05	28	64
		06	02	64	08	18	64
		09	15	64	09	22	64
		09	24	64	05	25	65
Explorer 19	1963 53A	12	19	63	02	05	64
		04	04	64	04	14	64

WORLD MAP INVENTORY (Continued)

Satellite Name	International Designation	Period					
		Start			End		
		Mo	Da	Yr	Mo	Da	Yr
Explorer 20	1964 51A	08	25	64	04	05	66
Explorer 21	1964 60A	10	04	64	12	14	65
		12	21	65	03	29	66
Explorer 22	1964 64A	10	31	64	12	10	64
		12	20	64	12	04	67
Explorer 23	1964 74A	11	06	64	01	18	66
Explorer 24	1964 76A	11	21	64	09	05	65
		09	05	65	05	04	66
Explorer 25	1964 76B	11	21	64	11	14	67
		06	08	66	09	06	66
Explorer 26	1964 86A	12	21	64	11	30	65
		01	15	66	08	08	67
Explorer 27	1965 32A	04	29	65	04	05	66
		06	07	66	11	05	67
Explorer 28	1965 42A	05	29	65	08	22	67
Explorer 29	1965 89A	11	06	65	01	24	67
Explorer 30	1965 93A	11	19	65	11	14	67
Explorer 31	1965 98B	11	29	65	11	19	67
Explorer 32	1966 44A	05	25	66	04	18	66
Explorer 33	1966 58A	07	02	66	01	16	68
Explorer 34	1967 51A	05	24	67	09	24	67
FR-1	1965 101A	12	06	65	08	29	67
Geophysical Research Satellite	1963 26A	06	28	63	09	08	63
GGSE	1964 1B	01	11	64	02	10	64
		03	04	64	04	14	64
Gravity Gradient 4	1967 53C	06	05	67	08	15	67
Gravity Gradient 5	1967 53D	06	26	67	11	07	67
Greb 1	1960 Eta 2	01	11	61	03	16	61
		03	21	61	04	23	61
		04	29	61	05	04	61
Greb 4	1963 21C	06	16	63	07	31	63
Greb 5	1964 01D	01	11	64	01	25	66
Greb 6	1965 16D	03	10	65	03	08	66
Injun 3	1962 Beta Tau 2	02	16	63	12	03	63
Lofti 2A	1963 21B	06	15	63	07	19	63
Nimbus 1	1964 52A	08	28	64	10	06	64
		12	29	64	04	27	65
Nimbus 2	1966 40A	05	15	66	08	29	67
OAO 1	1966 31A	04	08	66	08	30	66
OGO 1	1964 54A	09	05	64	12	31	64
		01	05	65	01	02	68

WORLD MAP INVENTORY (Continued)

Satellite Name	International Designation	Period					
		Start			End		
		Mo	Da	Yr	Mo	Da	Yr
OGO 2	1965 81A	10	14	65	08	04	66
		11	23	66	06	21	67
OGO 3	1966 49A	06	07	66	10	17	67
OSO 1	1962 Zeta 1	03	07	62	08	13	63
		09	21	63	10	01	63
		12	05	63	12	13	63
		01	21	64	04	14	64
OSO 2	1965 7A	02	03	65	11	06	65
		11	02	65	09	10	66
OSO 3	1967 20A	03	08	67	01	06	68
OV5-1	1967 40E	06	28	67	12	01	67
Pageos	1966 56A	06	24	66	11	14	67
Pegasus 1	1965 9A	02	16	65	10	03	67
Pegasus 2	1965 39A	07	06	65	12	05	67
Pegasus 3	1965 60A	07	30	65	10	31	67
Pioneer 5	1960 Alpha 1	03	11	60	03	11	60
Relay 1	1962 Beta Upsilon 1	02	18	63	02	26	63
		03	11	63	01	04	66
		02	01	66	11	08	66
Relay 2	1964 3A	01	21	64	10	17	67
San Marco 1	1964 84A	12	15	64	01	05	65
Saturn (SA-5)	1964 5A	01	29	64	05	03	66
Secor 2	1965 17B	03	11	65	05	19	65
Secor 3	1965 16E	03	09	65	12	05	67
Secor 4	1965 27B	04	03	65	05	11	65
Secor 5	1965 63A	08	10	65	09	27	66
Secor 6	1966 51B	06	09	66	05	26	67
Secor 7	1966 77B	08	19	66	01	17	67
Secor 8	1966 89B	10	05	66	02	14	67
Surcal	1965 65E	09	01	65	09	28	65
Syncom 2	1963 31A	07	26	63	04	06	65
Syncom 3	1964 47A	08	20	64	10	27	64
		11	03	64	04	13	65
Telstar 1	1962 Alpha Epsilon 1	09	03	62	01	21	63
		02	04	63	05	13	63
		05	27	63	07	02	63
		07	08	63	07	16	63
		07	22	63	08	27	63
Telstar 2	1963 13A	08	12	63	11	02	64
		11	15	64	12	14	64
		01	11	65	05	18	65
TIROS 1	1960 Beta 1	02	26	61	06	18	61
		12	04	61	01	29	62

WORLD MAP INVENTORY (Continued)

Satellite Name	International Designation	Period					
		Start			End		
		Mo	Da	Yr	Mo	Da	Yr
TIROS 2	1960 Pi 1	01	15	61	07	02	61
		08	13	61	12	11	61
TIROS 3	1961 Rho 1	07	12	61	07	23	61
		07	30	61	03	12	62
TIROS 4	1962 Beta 1	03	05	62	06	25	62
		07	23	62	03	26	63
TIROS 5	1962 Alpha Alpha 1	06	19	62	10	08	63
TIROS 6	1962 Alpha Psi 1	09	18	62	09	25	62
		10	01	62	06	09	64
		06	15	64	09	16	64
TIROS 7	1963 24A	06	19	63	11	16	65
		11	23	65	10	31	67
TIROS 8	1963 54A	12	21	63	08	24	65
		08	31	65	10	12	65
		12	21	65	07	25	67
TIROS 9	1965 4A	01	22	65	03	30	65
		04	06	65	06	29	65
		07	06	65	08	29	67
TIROS 10	1965 51A	07	01	65	07	13	65
		07	20	65	09	07	65
		09	14	65	02	08	66
		02	15	66	05	31	66
		05	31	66	06	27	67
Traac	1961 Alpha Eta 2	11	15	61	11	20	61
		11	27	61	01	01	62
		01	08	62	04	02	62
Transit 2A	1960 Eta 1	01	11	61	03	16	61
		03	21	61	04	23	61
		04	29	61	05	04	61
Transit 3B	1961 Eta 1	02	22	61	04	02	61
Transit 4A	1961 Omicron 1	08	10	61	12	24	62
		12	31	62	01	22	63
		01	27	62	03	19	63
TRS 2	1963 14B	05	10	63	09	23	63
		09	29	63	11	19	63
TRS 4	1963 30B	07	20	63	08	04	63
		08	14	63	12	10	63
TRS 5	1963 39B	10	17	63	11	04	63
TRS 6	1964 40C	07	17	64	03	16	65
Vanguard 1	1958 Beta 2	03	18	58	12	17	60
		01	25	61	12	11	61
		12	27	61	04	30	62
		06	11	62	01	21	63
		02	04	63	03	04	63
Vanguard 3	1959 Eta 1	09	18	59	12	11	59
Vostok 5	1963 20A	06	15	63	06	18	63
Vostok 6	1963 23A	06	18	63	06	21	63

PART VII. DATA RECEIVED AND IN PROCESSING

The Data Center staff makes every effort to ensure that all data on hand are fully documented and in a form that can be utilized. In certain cases, the data or documentation from experiments listed here are incomplete, or distribution of the data may have been delayed at the request of the experimenter. This section contains a listing of data received by NSSDC but not yet ready for distribution. This list was compiled April 15, 1968.

Data from these experiments may be available before the publication of the next *Catalog*. A requester should inquire about the status of the data before sending a formal request.

Satellite	Experiment	Experimenter(s)	Affiliation
Relay 2 1964 3A	Charged Particle	W. Brown	BTL
Explorer 26 1964 86A	Charged Particle	W. Brown	BTL
1961 Alpha Epsilon*	Impedance Probe	J. Ulwick	AFCRL
1962 Alpha Chi*	Impedance Probe	J. Ulwick	AFCRL
1962 Phi 1*	Impedance Probe	J. Ulwick	AFCRL
1962 Lambda*	Impedance Probe	J. Ulwick	AFCRL
1962 Alpha Gamma*	Impedance Probe	J. Ulwick	AFCRL
1962 Alpha Beta*	Impedance Probe	J. Ulwick	AFCRL
1962 Beta Kappa*	Impedance Probe	J. Ulwick	AFCRL
1963 38C*	Charged Particle	C. Bostrom	APL
OGO 1 1964 54A	Solar Cosmic Ray	K. Anderson	CALB
OGO 1 1964 54A	VLF Receiver	R. A. Helliwell	SRI

*Identified by international designation only.

Satellite	Experiment	Experimenter(s)	Affiliation
1964 83C*	Magnetometer	A. J. Zmuda	APL
Gemini 5 1965 68A	Cloud Top Spectrometer	F. Saiedy	NWSC
Lunar Orbiter 1 1966 73A	Selenodesy	W. H. Michael R. H. Tolson J. Lovell W. Martin	LARC LARC JPL JPL
Lunar Orbiter 2 1966 100A	Selenodesy	W. H. Michael R. H. Tolson J. Lovell W. Martin	LARC LARC JPL JPL
Lunar Orbiter 3 1967 8A	Selenodesy	W. H. Michael R. H. Tolson J. Lovell W. Martin	LARC LARC JPL JPL
Lunar Orbiter 4 1967 41A	Selenodesy	W. H. Michael R. H. Tolson J. Lovell W. Martin	LARC LARC JPL JPL
Lunar Orbiter 5 1967 75A	Selenodesy	W. H. Michael R. H. Tolson J. Lovell W. Martin	LARC LARC JPL JPL

*Identified by international designation only.

APPENDIX A. DETECTOR THRESHOLD ENERGIES

ELECTRON ENERGIES

10 kev to <1 Mev		1 Mev to<5 Mev		⩾5 Mev	
Satellite	Page	Satellite	Page	Satellite	Page
Explorer 4	10	Explorer 1	9	Explorer 4	10
Explorer 6	13	Explorer 4	10	Explorer 6	12
Explorer 11	14	Explorer 6	11	Explorer 11	14
Explorer 12	15	Explorer 7	24	Explorer 15	21
Explorer 14	18	Explorer 12	15	Explorer 18	27
Explorer 15	19	Explorer 14	18	Explorer 18	28
Explorer 15	20	Explorer 15	19	Pioneer 5	25
Explorer 15	21	Explorer 18	27		
Explorer 18	27	Explorer 18	28		
Explorer 18	28	Explorer 21	29		
Explorer 21	29	Pioneer 5	25		
OSO 1	16	Relay 1	22		
Telstar 1	17				
Telstar 2	23				

PROTON ENERGIES

10 kev to <6 Mev		6–30 Mev		>30 Mev	
Satellite	Page	Satellite	Page	Satellite	Page
Explorer 4	10	Explorer 1	9	Explorer 4	10
Explorer 6	13	Explorer 4	10	Explorer 6	11
Explorer 11	14	Explorer 6	11	Explorer 6	12
Explorer 12	15	Explorer 7	24	Explorer 7	24
Explorer 14	18	Explorer 12	15	Explorer 11	14
Explorer 15	19	Explorer 14	18	Explorer 12	15
Explorer 15	20	Explorer 15	19	Explorer 15	21
Explorer 18	27	Explorer 18	27	Explorer 18	27
Explorer 21	29	Explorer 18	28	Explorer 18	28
OSO 1	16	Explorer 21	29	Pioneer 5	25
Relay 1	22	Pioneer 5	25	Pioneer 5	26
Telstar 1	17	Relay 1	22	Relay 1	22
Telstar 2	23	Telstar 1	17	Telstar 1	17
		Telstar 2	23	Telstar 2	23

APPENDIX B. B, L TRANSFORMATION COMPUTER PROGRAM

NSSDC will distribute to users the most recent (May 1966) B, L transformation computer programs as received from Dr. Carl E. McIlwain of the University of California. Available programs are described below.

Routines for computing B and L have been in use for several years.* There are six routines, namely: INVAR, START, LINES, INTEG, CARMEL, and NEWMAG. These current routines are only slightly different from the previous versions with the exception of NEWMAG, which is a new, significantly faster routine that replaces the old MAGNET routine. The main routine is INVAR. The calling sequence is:

CALL INVAR (FLAT, FLONG, ALT, ERR, B, FL)

All of the arguments are floating point numbers. The user must supply values for the first four arguments; the program computes B and FL.

FLAT = Geographic latitude in degrees
FLONG = East longitude in degrees
ALT = Height above the earth's surface in kilometers

The program computes B, the magnitude of the earth's field in gauss, and FL, the value of L in earth radii, at the point defined by FLAT, FLONG, and ALT. ERR is a quantity that controls the integration step.

The NEWMAG routine computes the earth's field. This routine can be used separately from the other routines. Two versions of NEWMAG, corresponding to different models of the earth's field, are supplied.

The Program Deck

The FORTRAN source deck is in four parts.

Part one contains TEST, INVAR, START, LINES, INTEG, and CARMEL. This deck has been compiled and run under CDC 3600 and IBM 7090 FORTRAN IV. It should run under FORTRAN II and CDC 1604 FORTRAN 63, where all function names have to be changed; SIN becomes SINF, etc. The cards for making the changes are at the back of deck 1. TEST is a main program that generates some test cases.

Deck 2 is NEWMAG using the coefficients published by Hendricks and Cain evaluated at the epoch 1960.

Deck 3 is NEWMAG using the older Jensen and Cain coefficients for 1960, which were used in the old February 1963 B, L routines. At the back of deck 2 and deck 3 are cards that make the changes necessary for FORTRAN 63. In addition, there are cards that give the results obtained by running the TEST routine.

*Dr. McIlwain's old version (1963) is also available through NSSDC.

Deck 4 is not part of the B, L program. Sets of coefficients for the spherical harmonic expansion of the earth's field have been given by Cain, et al. Deck 4 will convert any of these sets of coefficients to the form required by NEWMAG. The NEWMAG routines and two of the routines in deck 4 are derived from the routines given by Cain, et al, as outlined by McIlwain.*

*McIlwain, C. E., and A. Hassitt, "Guide for the Use of the B and L Programs," and "Computer Programs for the Computation of B and L," University of California, San Diego, California, May 1, 1966.

INDEX

A

B

C

D

E

F

Page

G

H

I

J

L

M

N

O

P

R

S

T

U

V

W

X